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Global ESG Equity Strategy

Beyond the Pandemic: The Green-Shaped Recovery

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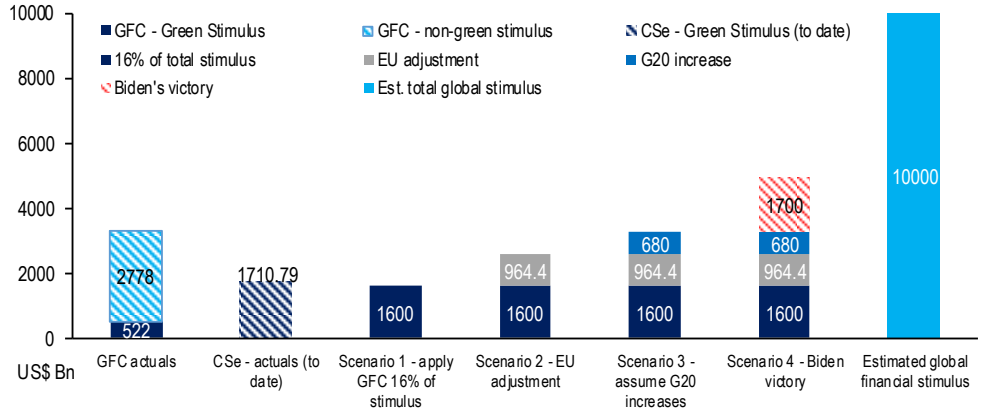
Environmental, Social and Governance (ESG) Research

In this report, we develop a proprietary database of Green Recovery policies and identify end-markets best positioned to benefit from a 'Green-Shaped Recovery'. We find that the economic drivers of Green Stimulus are compelling and offer a unique opportunity to align the immediate objective of fiscal recovery with the longer-term imperative of tackling climate change.

- Our analysis reveals that funding at the global level (to date) far exceeds the EU's Green Deal, with a total of US$1.71tn in Green Stimulus. However, only a moderate increase (vs the GFC) from 0.7% to 1% of GDP within the G20, could see this almost double at US$3.2tn in eventual stimulus. This is before we consider the prospect of a Biden victory and local and state level funding, which could see stimulus eventually exceed US$5tn.
- We believe the market may be underestimating the scale of such funding, with stimulus accelerating growth in themes already benefiting from a long runway of structural tailwinds. We find that the Transport and Infra. theme is the largest recipient to date (US$308.53bn), with the sub-theme of Electrification seeing most support globally (US$243.56bn). This is followed by Energy Transition (US$183.21bn), within which the sub-theme of Renewables is the largest beneficiary (US$106.02bn). Energy Efficiency and Circular Economy funding has been more modest to date at US$44.74bn and US$12.01bn, respectively.
- Throughout the report we highlight the themes best positioned to benefit from an increase in Green Stimulus across ten sub-themes, and identify a total of 253 stocks under CS coverage globally with positive exposure and a further 147 uncovered stocks with exposure (see Appendix). For balanced exposure across the core themes, we screen our 'Green-Shaped Recovery' stock universe for companies that average ≥40 for Quality, Momentum and Business Sustainability factor scores and then, for each theme, sort by the largest target price upside. See Figure 2 for our top 40 key Outperform-rated companies.

Figure 1: CSe—Green Stimulus (to date) and scenarios of eventual expenditure



Source: Company data, Credit Suisse estimates

Credit Suisse Environmental, Social and Governance (ESG) research seeks to focus on sustainability and accountability factors that are then integrated into the investment process.

Research Analysts

Phineas Glover
61 2 8205 4448
phineas.glover@credit-suisse.com

Eugene Klerk
44 20 7883 4678
eugene.klerk@credit-suisse.com

Betty Jiang, CFA
212 325 6259
betty.jiang@credit-suisse.com

Andrew M. Kuske
416 352 4561
andrew.kuske@credit-suisse.com

Chris Counihan
44 20 7883 7618
chris.counihan@credit-suisse.com

Dan Levy
212 325 4617
dan.levy@credit-suisse.com

Michael Weinstein, ERP
212 325 0897
w.weinstein@credit-suisse.com

John Walsh
212 538 1664
john.walsh@credit-suisse.com

Mark Freshney
44 20 7888 0887
mark.freshney@credit-suisse.com

Akinori Kanemoto
81 3 4550 7363
akinori.kanemoto@credit-suisse.com

Arjun Saini
44 20 7888 1553
arjun.saini@credit-suisse.com

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Executive Summary

The impact of COVID-19 on economic growth across developed markets this year has been profound with QoQ 2Q GDP declining by 9.8% in the US, 12.1% in the Eurozone and more than 20% in the UK. The pandemic is having a sizeable impact on developing countries too, irrespective of the strong bounce in China's 2Q GDP growth of +11.5% QoQ.

Governments increasingly realise that the almost US$10tn worth of economic stimulus introduced during the pandemic to date needs to translate into economic recovery programmes in order to allow the global economy to return back to growth and mitigate the longer term impact of COVID-19. At the same time we note that the need to address longer term climate change challenges has never been higher. Therefore 'business-as-usual' policies, such as those adopted after the Gobal Financial Crisis (GFC) of 2008-2009, is not an option this time. The need, and argument for, Green Stimulus is profoundly high, in our view.

In some of our past ESG work we reviewed the initial economic recovery programmes announced by the EU (e.g. The Impact of COVID-19 on the Green Agenda). This report, however, assesses the impact of COVID-19 recovery from a global perspective. We compile a global dataset of green recovery policies, outline why it makes sense that Green Stimulus forms a substantial and growing part of the announced recovery programmes and analyse which end markets and companies are best positioned to benefit from a 'Green-Shaped Recovery'.

How Green are the announced recovery packages?

The economic rationale for including green stimulus as part of recovery packages appears strong, in our view. For example, multiplier analysis such as that from Heidi Garett-Peltier suggest that investments in renewable and energy efficiency might be c3x more effective in terms of job creation in the construction phase than investments in traditional fossil fuel areas. IRENA estimates that by 2050 the global renewables industry could hold 42mn jobs; nearly four times the current level. Popular (i.e., voter) support for a focus on 'sustainable' recovery programmes provides additional support for Green Stimulus in our view: globally 65% of people feel that governments need to prioritise climate change in a post-COVID world.

Our analysis in this report finds that total Green Stimulus announced by governments around the world following the COVID crisis has now reached US$1.71tn. Based on several scenarios that we develop, we believe that government Green Stimulus could reach US$5tn. Furthermore, as this only refers to government spending, or federal in case of the US, we can see a further rise in spending as private and local governments invest alongside governments. Overall, we find a compelling investment thesis for companies and end-markets exposed to Green Stimulus, with funding acting as a significant catalyst within sustainability themes already benefiting from a long runway of structural, and in some cases, secular tailwinds.

Our analysis of confirmed spending plans to date reveals that the theme of Transport and Infrastructure is the biggest recipient to date (US$308.53bn), with the sub-theme of EVs seeing the biggest policy support globally (US$243.56bn). This is followed by measures to accelerate Energy Transition (US$183.21bn), with the sub-theme of Renewables being the largest beneficiary (US$106.02bn). Energy Efficiency and Circular Economy funding pledges have been more modest to date at US$44.74bn and US$12.01bn, respectively, with the latter seeing a lift in funding pre-COVID. Interestingly, we find that US$1.1tn of green funding has yet to be directed to specific end-markets, portending more positive funding catalysts from here.

The energy transition

The need to decarbonise the global economy is high if climate change targets are to be met. Under its Sustainable Development Scenario, the IEA expects global carbon emissions from the power sector to *fall* by >70% even as electricity generation *grows* by 46% from 2018 to 2040. This is enabled by wind and solar reaching a combined 40% of the global electricity generation mix by 2040, up from 7% in 2018. The COVID pandemic, however, looks set to result in a 10% decline in renewable investments this year thereby raising longer term capex targets.

Against this background, we review how the energy transition might impact key end markets. Specifically, we highlight beneficiaries in the renewables space (solar, wind and hydrogen) as well as in the chemical space given its position as key suppliers to a range of critical transition related technologies. Finally, we review how the oil majors are positioned vis-à-vis the energy transition and which of them look better placed at this point.

Transport & Infrastructure

To date cUS$309bn of the COVID-related Green Stimulus announced by governments target the transport and related infrastructure sector. The relevance of this is clear as the transport sector accounts for 55% of global oil consumption and for 22% of global CO_2 emissions. The key challenges in addressing this are: (1) changing consumer behaviour into opting for multi-modal and less polluting transport modes (i.e., a move from car usage to public transport, bicycles and walking) and (2) to improve the energy efficiency of existing transport (e.g., fuel efficiency solutions and technologies and a move to electric vehicles).

The theme of infrastructure covers four distinct areas, in our view. These are power, buildings, transport and communication. The need to electrify the economy, not least through the use of renewable energy generation equipment, means that investments in smart grid electricity infrastructure will be an imperative. We highlight key exposed sub-themes in the note, including transport energy efficiency, multi-modal, electrification, construction, and energy networks. Furthermore, we see a need for smart-technology-related infrastructure investments too (e.g. smart cities/grids) in order to improve transport energy efficiency.

Energy efficiency

We believe that energy efficiency is the cheapest and easiest way to reduce energy demand and CO_2 emissions. By 2035E, the IEA estimates that US$550bn will be invested per year in energy efficiency solutions. The focus here is on buildings, accounting for 39% of global GHG emissions by source, and general industrial activities, accounting for a further 32% of emissions. Areas set to benefit from a greater focus on building and industry energy efficiency include construction and materials (especially those focused on near-zero buildings), HVAC and lighting, insulation materials and technologies, smart building solutions, heat transfer, industrial automation and robotics, renewable interconnections, and power distribution and generation.

Circular economy

The need for a circular economy model is high in our view and fuelled by the COVID pandemic which has resulted in the temporary closure of waste and recycling operations in many countries and a slowdown in new capacity investments. The reason the circular economy is a key component of meeting long-term climate change targets is that the energy transition and energy efficiency measures are unlikely to address all emissions. Research from the Ellen Macarthur Foundation suggests that almost half of the remaining emissions generated by cement, aluminium, plastic and food production can be eliminated by applying circular-economy strategies. Within the plastic exposed supply chain we see a number of key beneficiaries, with a focus on reduction, recovery and replacement of plastic products.

Key stocks

Throughout the report for each of the themes we highlight companies well positioned to benefit from an increase in Green Stimulus and set-out the existing structural drivers that such funding will accelerate. Across the ten sub-themes, we identify a total of 253 stocks under CS coverage globally with positive exposure and a further 147 uncovered stocks with exposure (see Appendix). For balanced exposure across the group of core themes, we screen our Green Stimulus stock universe by an average of ≥40 for Quality, Momentum and Business Sustainability factor scores and then, for each theme, sort by the largest CS target price upside to identify a short list of our top 40 key Outperform-rated companies (see Figure 2).

Figure 2: Top 40 stock exposures to Green Stimulus

Company	Theme	TP	CS TP Upside	CS Rating	MC (US$ bn)	P/E		Sales	Earnings	Quality	Momentum	Business Sust-ability	Refinitiv ESG Momentum
						12MF	12MF/5Y median	Consensus '20-22' CAGR		Percentile rank			
Orbia Advance Corp	Energy Transition	MXN57	55.5%	O	3.5	14.3	2%	7%	37%	47	33	52	21.1%
Landis + Gyr	Energy Transition	SFr88	48.65%	O	1.9	17.3	16%	-1%	9%	54	36	59	0.0%
Bloom Energy	Energy Transition	US$24	47.24%	O	2.2	na	na	26%	na	20	95	34	0.0%
Tongwei	Energy Transition	Rmb32	36.40%	O	14.6	21.8	40%	23%	26%	51	90	38	119.2%
Johnson Matthey	Energy Transition	p3100	30.80%	O	6.0	14.4	5%	4%	16%	54	24	54	19.1%
Longyuan Power	Energy Transition	HK$7	30.78%	O	5.2	7.0	-17%	6%	11%	26	66	43	2.1%
Siemens	Energy Transition	€145	22.22%	O	119.3	18.0	31%	4%	19%	54	74	56	0.1%
Murata Manufacturing	Energy Transition	¥7600	18.75%	O	38.5	22.0	28%	8%	21%	39	54	51	3.7%
First Gen Corporation	Energy Transition	P27	13.92%	O	1.8	7.4	-1%	9%	11%	43	44	59	na
LG Chem Ltd.	Energy Transition	W810000	13.60%	O	44.9	37.1	177%	18%	35%	32	90	48	0.4%
Xinyi Solar Holdings	Energy Transition	HK$11	13.42%	O	10.1	19.5	99%	27%	25%	66	87	39	0.0%
China Railway Construction Corp.	Transport & Infra	HK$13	103.08%	O	16.5	3.3	-45%	10%	10%	33	46	43	-11.3%
Renesas Electronics	Transport & Infra	¥1290	89.15%	O	11.0	29.3	44%	5%	44%	18	79	50	-0.3%
China Railway Group Limited	Transport & Infra	HK$7	74.00%	O	18.6	3.7	-47%	10%	11%	35	47	51	0.0%
CIMIC Group Limited	Transport & Infra	A$34	55.04%	O	5.0	10.1	-42%	0%	6%	89	14	59	18.3%
LafargeHolcim	Transport & Infra	SFr61	40.59%	O	29.4	14.1	-2%	5%	16%	24	61	54	4.8%
Raytheon Technologies	Transport & Infra	US$81	32.90%	O	93.1	17.3	4%	7%	34%	77	17	51	10.2%
Dana, Inc.	Transport & Infra	US$18	29.31%	O	2.0	11.2	46%	13%	222%	63	53	43	0.0%
MinebeaMitsumi	Transport & Infra	¥2400	28.62%	O	7.5	16.0	34%	3%	20%	23	72	49	-5.9%
CRH	Transport & Infra	€41	26.15%	O	30.2	16.1	7%	7%	17%	26	66	43	-1.2%
Analog Devices Inc.	Transport & Infra	US$150	25.10%	O	44.3	22.2	21%	na	na	96	84	59	1.8%
Lear Corporation	Transport & Infra	US$143	24.08%	O	6.9	12.7	45%	13%	128%	77	73	56	21.8%
LG Innotek	Energy Efficiency	W190000	27.09%	O	3.0	9.2	-25%	8%	15%	40	80	52	5.4%
Chroma	Energy Efficiency	NT$206	25.61%	O	2.3	19.3	8%	10%	19%	56	37	59	21.3%
IBP	Energy Efficiency	US$111	25.44%	O	2.6	18.7	-1%	9%	18%	82	95	49	19.9%
Siemens	Energy Efficiency	€145	22.22%	O	119.3	18.0	31%	4%	19%	54	74	56	0.1%
STMicroelectronics NV	Energy Efficiency	€30	18.44%	O	27.3	24.0	31%	11%	44%	20	83	62	3.7%
Electrolux	Energy Efficiency	Skr215	15.13%	O	6.1	17.3	27%	4%	49%	33	84	48	9.4%
TopBuild	Energy Efficiency	US$176	13.95%	O	5.1	21.3	32%	7%	17%	81	96	48	42.2%
Halma	Energy Efficiency	p2530	13.00%	O	11.2	39.9	51%	6%	9%	81	31	64	4.6%
Sika	Energy Efficiency	SFr240	12.78%	O	33.3	36.8	55%	7%	21%	66	57	54	19.8%
Acuity Brands	Energy Efficiency	US$123	11.66%	O	4.4	13.9	-13%	na	na	83	59	58	38.8%
Emerson Electric	Energy Efficiency	US$77	10.35%	O	41.7	20.5	7%	3%	9%	80	77	52	2.4%
Schneider Electric	Energy Efficiency	€111	4.96%	O	69.4	22.9	48%	6%	20%	62	44	60	1.0%
WestRock	Circular Economy	US$59	92.87%	O	7.9	12.4	-8%	na	na	35	60	53	14.6%
China Everbright International Ltd	Circular Economy	HK$9	82.19%	O	3.9	4.5	-60%	5%	11%	41	37	54	na
Mondi	Circular Economy	p1855	24.87%	O	11.8	12.7	2%	3%	13%	44	64	52	1.8%
Smurfit Kappa	Circular Economy	€37	20.45%	O	8.5	12.9	14%	3%	13%	52	72	50	na
Stora Enso	Circular Economy	€14	17.65%	O	11.1	17.2	38%	3%	38%	14	66	41	0.0%
Crown Holdings Inc.	Circular Economy	US$84	11.54%	O	10.1	13.3	5%	4%	12%	61	69	50	0.0%

Source: Company data, Credit Suisse estimates

Green Recovery policies and stimulus

The COVID-19 crisis has meant that sustaining an effective public-health response remains a top concern for many policy makers and business executives. Severe job losses and revenue declines, along with economic recession, have compelled policy makers to mount an unprecedented financial response. Estimates of the combined fiscal stimulus already range from US$9tn to US$10tn.

However, the recovery from COVID-19 coincides with a pivotal time in addressing climate change. A return to business as usual could have a permanent impact on our emissions reduction pathway. As was the case with the global financial crisis, the economic slowdown only temporarily reduced global greenhouse-gas (GHG) emissions in 2009. By 2010, emissions had reached a record high, as governments implemented measures to stimulate economies.

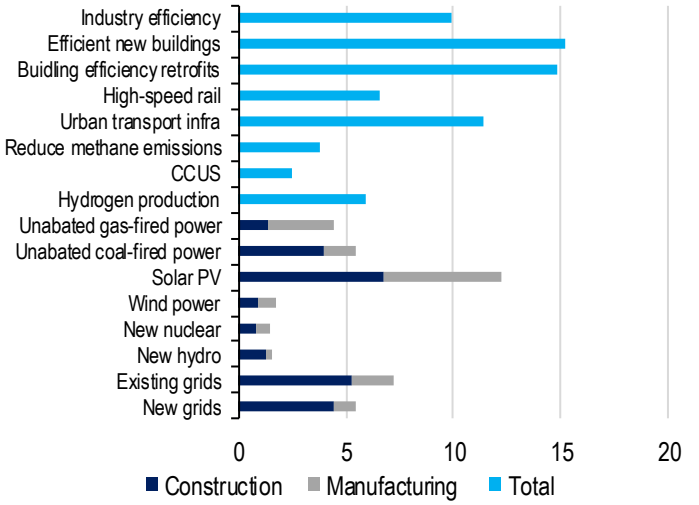
The danger now is that the same pattern repeats itself. The period after the COVID-19 crisis could determine whether the world meets or misses the emissions goals of the 2015 Paris Agreement. The stakes could not be higher. An Asian Development Bank (ADB) study shortly before the pandemic projected an average of a 13.6% decrease in per capita GDP driven by climate impacts across Asia Pacific by the mid-century. Another report from the UN puts the economic loss from growing disasters (including those triggered by climate change) for the region at $675bn, or around 2.4% of the region's GDP per annum.

We believe the thematic of a green recovery offers nations a unique opportunity: green stimulus can align the immediate objective of fiscal recovery plans with the longer term imperative of tackling the next systemic crisis of climate change. Originally a technical term describing the use of post-disaster reconstruction to increase a country's resilience and stimulate growth, the concept of 'build back better' is being embraced by business and policy leaders to create a more sustainable post-pandemic world.

The drivers of Green Stimulus are compelling

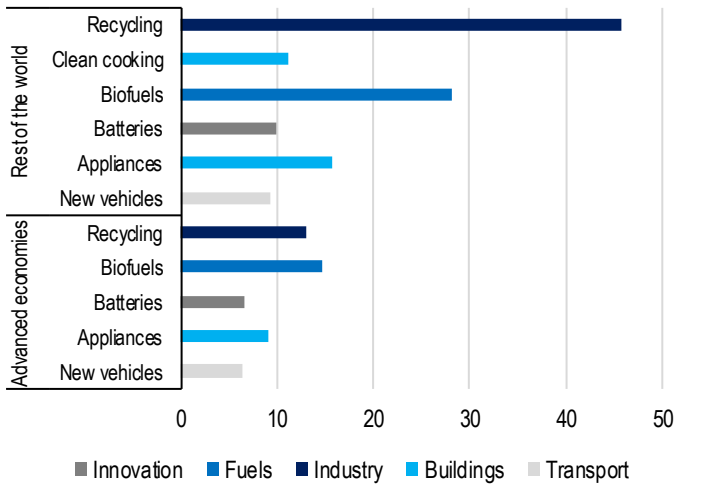
- **Highly effective at boosting growth:** The multiplier of infrastructure investment is 1.7x in a recession (using a composite of six studies from the IMF). It is a very effective way of stimulating growth, whereas a proportion of tax cuts is used for savings and therefore suffers fiscal leakage. Effective fiscal policy is especially important when there is no opportunity to cut rates any further (real rates in a recession have historically fallen by c5%).
- **With higher multiplier effects in developing nations:** Green stimulus is also a natural place to focus recovery efforts in developing nations. According to the World Bank, low- and middle-income countries alone could see a return of $4 for every $1 invested from investing in infrastructure that prioritises future-focused resilience. In China, every $1 bn of public green investment is expected to increase household consumption by $61 mn and tax revenues by $10 mn, with 42,000 new jobs created (UNEP 2009). In developing economies, every $1 invested in improving the energy efficiency of electricity generation saves more than $3 in operating costs (ESCAP).
- **Linked to productivity enhancement:** It has been estimated that every $1bn invested in energy efficiency in the US could eventually generate cost savings of $450 mn per year, reduce annual GHG emissions by 592,600 tonnes, and lead to approximately 30,000 job-years—a 20% increase in job creation over more traditional fiscal stimulus measures such as income tax cuts or road building (Houser et al. 2008).
- **Can reduce government debt:** McKinsey points out that the RoE on road improvement is 20%. This is nearly 30x higher than the cost of government debt. It would be possible to fund (via PFI) the building of a bridge and thereafter fund it with CPI minus 40 bp (i.e. the current US TIPS yield) over the lifetime of the project, reducing net government debt.

Figure 3: Green stimulus options—construction and manufacturing jobs created per US$1mn capex



Source: IEA, IMF, Credit Suisse

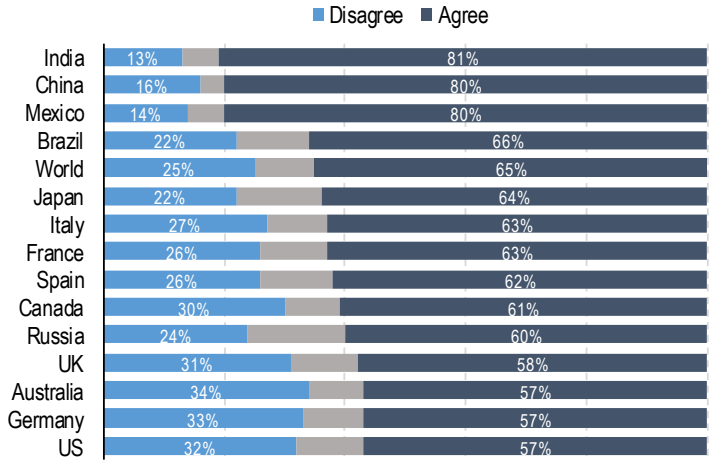
Figure 4: Green stimulus options—construction and manufacturing jobs created per US$1mn capex



Source: IEA, IMF, Credit Suisse

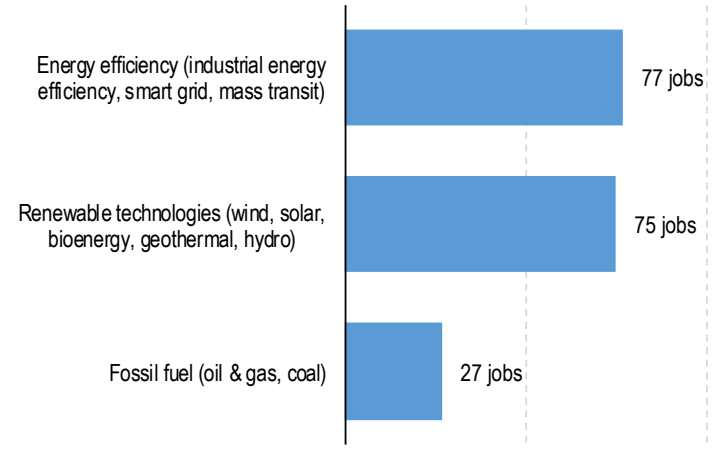
- **A jobs creator:** IRENA estimates that by 2050 the renewables industry could hold 42 mn jobs; nearly four times the current level (Figure 43). In such a scenario jobs from the fossil fuel sectors would decline to 22mn by 2050, nearly 30% lower than 2017 levels. A report from BOEM (in cooperation with NREL) found that in the Gulf of Mexico, an offshore wind farm (600MW commissioned in 2030) would create nearly 4,500 jobs and 150 ongoing jobs during operation—in comparison, an IMF working paper estimates that the long-run job creation from an additional rig-count in the US is 224 jobs.[i] To make a dollar-for-dollar comparison, research from Garrett-Peltier (2017)[ii] found that $1mn invested in fossil fuel industries generates 2.65 FTEs in early stages, while the same amount invested in renewable energy or energy efficiency yields 7.72 FTEs.
- **A clear-cut shortage of infrastructure:** Even before the crisis, government infrastructure spending as a percentage of GDP was c30% below its post-1960 average across most of the developed world. The Global Infrastructure Hub (GIH) set up by the G20 estimates that infrastructure expenditure as a percentage of GDP needs to rise from c2.9% to 3.6% p.a. globally to meet a $15tn shortfall in investment by 2040.
- **Finally, an actual track-record of delivering growth:** While spending on Green Stimulus at the EU level was much less post the GFC than recently announced in response to COVID-19, it was a resounding success. Green stimulus post GFC is estimated on average to have cost around 0.2-0.3% of GDP, provided a boost to GDP at a national level of around 0.6-1.1%, depending on the level of ambition in each country, and as much as 1.5% at a European Union level (Cambridge Econometrics, 2011). This was in the context of a 0.1% decrease in global GDP during the financial crisis, with G7 countries recording an average decline of 3% (IMF, 2020b).

Figure 5: Survey—government actions should prioritise climate change in the economic recovery from COVID-19



Source: Ipsos MORI, survey conducted via online poll 17-19 April 2020; n= 28,039

Figure 6: Jobs created, directly and indirectly, per $10mn in spending


Energy efficiency (industrial energy efficiency, smart grid, mass transit)
77 jobs
Renewable technologies (wind, solar, bioenergy, geothermal, hydro)
75 jobs
Fossil fuel (oil & gas, coal)
27 jobs

Source: Heidi Garett-Peltier: Comparing the employment impacts of energy efficiency, renewable energy, and fossil fuels using an input-output model

The green recovery policy response (so far)

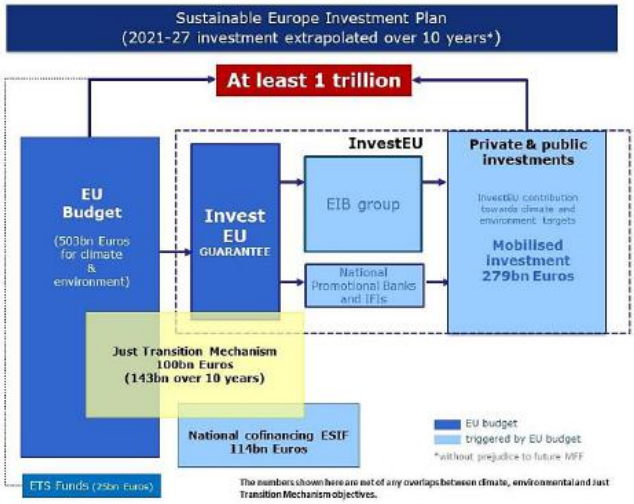
Green stimulus is the application of policies and measures to stimulate short-run economic activity while at the same time preserving, protecting and enhancing environmental and climate both near term and longer term. The focus in the definition is on measures to increase short-run economic activity with lasting beneficial environmental impacts. The fundamental premise is that "win-win" outcomes can be achieved for the economy and the environment. So far, the signs that governments will 'hold the line' on green recovery policies are encouraging.

EU Green Deal Investment Plan

In January, the EC announced a €1 tn **Green Deal Investment Plan** for the next decade, to be financed through several mechanisms (predominantly the EU Budget, but also through other mechanisms such as via the EIB, private investment, member-state financing and the Just Transition Mechanism: see Figure 7). In May the EC announced **Next Generation EU**, a recovery package of €750bn (€500bn in grants and €250bn in loans, raised by borrowing from financial markets to be repaid across 2028-58) which alongside a **reinforced budget** takes the 'financial firepower' of the EU budget to €1.85tn, supporting not only economic recovery but also the energy transition and digital transition within Europe.

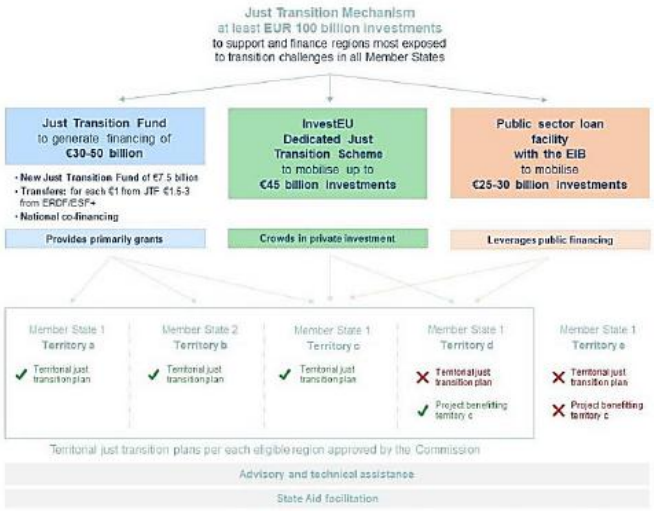
- **Building renovation and energy efficiency:** The EU aims to triple the current renovation rate, which stands at around 1% of the building stock. With the recovery plan, the Commission now wants to achieve faster renovation of buildings, noting that it is a requirement for a net climate neutral EU. One aspect of the Work Programme is the Renovation Wave to modernise buildings and critical infrastructure which will be presented in detail "after the summer" and will contain a complementary 'European Renovation Financing Facility' of €350bn p.a. in investments. Priority will go first to public sector buildings, especially hospitals and schools, as well as social housing and other forms of low income dwellings, but will switch to private residential buildings through €50bn in financing support for Green Mortgages. The Commission may also revise its state aid rules in order to provide an enabling framework for public authorities to support high quality renovation. Considering academic findings on the benefits of green construction projects based on assessments of implemented policies following the GFC (delivers higher economic multipliers, high short-term job creation, less susceptible to offshoring to imports, etc.), such policy is well chosen to deliver not only economic recovery but also support for the Green Agenda.[iii]

Figure 7: Summary of the €1 tn Green Deal


Sustainable Europe Investment Plan
(2021-27 investment extrapolated over 10 years*)
At least 1 trillion
EU Budget
(503bn Euros for climate & environment)
Invest EU GUARANTEE
InvestEU
EIB group
National Promotional Banks and IFIs
Private & public investments
InvestEU contribution towards climate and environment targets
Mobilised investment 279bn Euros
Just Transition Mechanism
100bn Euros
(143bn over 10 years)
National cofinancing ESIF
114bn Euros
EU budget
triggered by EU budget
*without prejudice to future MFF
ETS Funds (25bn Euros)
The numbers shown here are net of any overlaps between climate, environmental and Just Transition Mechanism objectives.

Source: European Commission

Figure 8: Composition of the Just Transition Mechanism


Just Transition Mechanism
at least EUR 100 billion investments
to support and finance regions most exposed to transition challenges in all Member States
Just Transition Fund
to generate financing of
€30-50 billion
• New Just Transition Fund of €7.5 bilion
• Transfers: for each €1 from JTF €1.5-3 from ERDF/ESF+
• National co-financing
InvestEU Dedicated Just Transition Scheme
to mobilise up to
€45 billion investments
Public sector loan facility
with the EIB
to mobilise
€25-30 billion investments
Provides primarily grants
Crowds in private investment
Leverages public financing
Member State 1 Territory a
Territorial just transition plan
Member State 2 Territory b
Territorial just transition plan
Member State 1 Territory c
Territorial just transition plan
Member State 1 Territory d
Territorial just transition plan
Project benefiting territory c
Member State 1 Territory e
Territorial just transition plan
Project benefiting territory c
Territorial just transition plans per each eligible region approved by the Commission
Advisory and technical assistance
State Aid facilitation

Source: European Commission

- **Renewables:** Key additional aspects in the recovery plan include an EU tendering scheme for renewable electricity projects worth 15 GW over two years, with a total capital investment of €25bn. According to EU Commission estimates, the EU would have to produce between 230 and 450 GW of wind at sea by 2050 to meet the targets laid out in the European Green Deal. There will also be support for national schemes with €10bn over two years, using co-financing by EIB.
- **Hydrogen:** The EC plans to double funding for clean hydrogen research and innovation, currently standing at €650 mn. A fund worth €10bn per year, administered by the EIB, will also make funding available for hydrogen infrastructure. The EC has also unveiled a Hydrogen Strategy, aiming to install 6GW of green hydrogen electrolyers in the EU by 2024, expanding to 40GW by 2030 (supporting the production of 10 mtpa of hydrogen). This will be supported by the ETS Innovation Fund, Next Generation EU, and Carbon CfD. Outside of this, Germany has announced the largest hydrogen stimulus with US$9.91bn going towards 5GW of renewable production capacity by 2030.
- **Future mobility—autos:** The plan proposes an EU-wide Purchasing Facility that will make available €20bn in the next two years for Clean Vehicles that reduce CO_2 and pollutant emissions in line with EU standards. Interestingly, this could form a subsidy for both EVs and high fuel efficiency vehicles. Furthermore, a Clean Automotive Investment Fund will accelerate the investments in zero-emission drive trains, with €40-60bn in funding.
- **Future mobility—infrastructure and rail:** The EU also proposes to double investment in electric car recharging infrastructure, with the objective of reaching 2 mn public charging and alternative refuelling stations by 2025. A Renaissance of Rail Investment package will allocate €40bn focusing on key corridors where passengers and freight can shift to rail. Financial support will also be provided to replenish rolling stock and bring night-train services back into Europe. The recovery plan will also allocate funding for urban mobility, such as cycling infrastructure, financed under the regional funding programmes.
- **Circular economy:** While COVID-19-related disruptions in waste collection and shipment are expected to be temporary, the recycling industry is impacted by the overall economic downturn. In particular, plastic recycling has been impacted due to lower virgin feedstock prices owing to the decline in oil prices. Under the EU plan, the EC states that it will direct fresh investments to the waste management sector, in particular to recycling technologies and infrastructure. The investment gap for implementation of the existing EU waste legislation has been estimated at approximately €17bn for the period 2021-27. Increased ambition in recycling of plastics will add another €4bn to this investment gap.

Biden's Green Recovery plan

Biden has announced extensive Green Stimulus policies that include federal investment of US$1.7tn over the next ten years, plus additional investment of US$3.3tn from the private sector, state and local governments. While Biden's plan lacks details around costs and implementation, the funding policies align closely with the themes we have identified through our review of global green recovery policies. Given the proposed scale, the implementation of such a plan would be a transformative catalyst in green recovery stimulus globally.

- **Going multi-modal:** The infrastructure component of the policy focuses on investment in railroads, public bus services and municipal transit networks. Investment is also earmarked for infrastructure for pedestrians, cyclists, and riders of e-scooters and other micro-mobility vehicles and integration technologies such as machine-learning optimised traffic lights.
- **Clean energy by 2035:** Biden's plan proposes to accelerate renewable energy deployment and achieve net-zero emissions by 2035, which will be positive for all renewables and utilities. Zero carbon targets could also be achieved via carbon tax/fee, but past efforts to create a carbon cap and trade system or carbon tax have not received popular support, while any proposal that can be labelled "tax" has a mountain to climb for consensus.
- **Clean vehicles:** Policies include use of federal procurement of 3mn 'American-sourced' clean vehicles, rebates for switching to newer, more efficient vehicles, investing in 500k EV charging stations, converting 500k buses to zero-emissions vehicles by 2030, and stronger fuel efficiency standards (see below).
- **Fuel efficiency:** Will likely accelerate EV adoption, positive for regulated utility rate base growth across the country to upgrade electricity distribution systems. We do not expect any significant increase in electricity needs for EV (<1% even if all cars go electric), but a separate rate class for EV charging could be positive for utilities in metropolitan regions.
- **Developing domestic renewable/storage supply chain:** Domestic supply for solar/wind/batteries etc could be achieved via more import tariffs or tax breaks for manufacturers. However, on the demand side, a "Made in America" clause might not fly well under WTO rules. Historically the US government has opposed domestic content requirements in other countries (such as India). Investment in new battery storage and transmission infrastructure is a major component of the plan.
- **Electricity transmission investments:** Investment is signposted in energy efficiency, clean energy, electrical systems and line infrastructure that makes it easier to electrify transportation**.** Positive for electric utilities with extensive transmission construction plans. Also positive for renewable projects in new regions away from transmission lines today (solar, onshore wind, offshore wind).
- **Tax incentive extensions:** Could be similar to prior Democratic proposals to extend and expand tax credits for renewables, energy efficiency and zero carbon technologies, which we believe lifts all renewable and utility stocks. Please see our 6/9 note and 6/24 note for key policy and tax implications from Democratic bills, and our 2020 outlook note for potential implications across the space.
- **Building energy efficiency plans:** The plan commits to upgrade 4mn commercial buildings, subsidies for homes to implement energy efficiency measures, to construct 1.5mn new affordable and energy efficiency homes, and upgrade public school premises for energy efficiency.
- **Stronger regulation of fossil fuels:** Aside from direct stimulus, a big feature of the plan is further regulation of fossil fuels, such as: capping oil and gas wells; methane pollution limits; rolling back tax incentives; banning new oil and gas on public lands; modifying royalties to account for climate costs; and, among others, prohibiting certain agencies from financing coal power plants.

Sizing up total Green Stimulus

Lessons from the GFC

In the context of the right response to the pandemic, it has been widely reported that one of the great policy failures post the Global Financial Crisis (GFC) was the lack of coordinated effort to incorporate a sizeable "green fiscal" component to expansionary policies. We find that this is only half of the story, in fact.

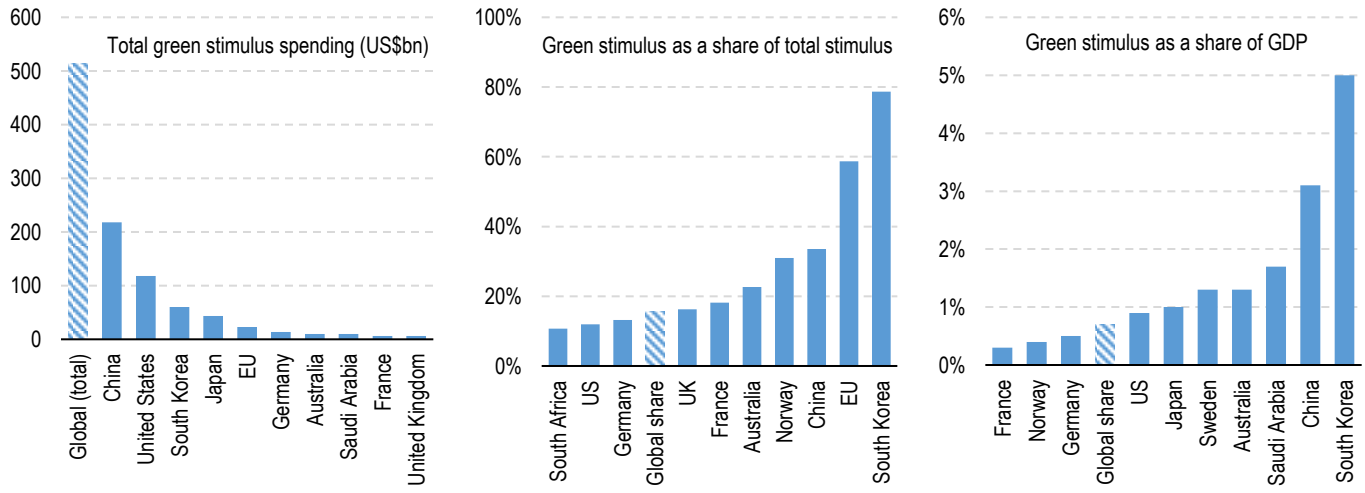
What was unique about the policy response to the GFC was that it was the first substantial example of its kind whereby governments combined policy measures to boost aggregate demand and growth with measures that supported green projects. Such measures were in fact wide ranging, including support for renewable energy, carbon capture and sequestration, energy efficiency, public transport and rail, and improving electrical grid transmission.

Of the US$3.3tn allocated worldwide to fiscal stimulus over 2008-09, US$522bn was devoted to such green expenditures or tax breaks (Robins et al. 2009 and 2010). It is only with hindsight, that we can say that larger green fiscal stimulus would have provided an even larger economic (and environmental) multiplier in response to the GFC. It is for this reason and those outlined above, that we see compelling drivers of green stimulus.

Although global clean energy investment in 2008-09 helped to unlock growth in wind and solar photovoltaic (PV) technologies, and to improve the resilience of gas and electricity networks, the overall recovery from the financial crisis was carbon intensive. Following an initial decline in emissions of 0.4 Gt CO2 in 2009, emissions rebounded by 1.7 Gt CO2 in 2010. A re-run of this would not be consistent with tackling runaway climate change and government commitments to meeting the Paris Agreement.

What is particularly interesting about this retrospective is how little of the overall fiscal stimulus was provided by Europe. Total green spending by all of Europe totalled only US$57bn; in contrast, the Asia Pacific region spent US$342bn (Robins et al. 2010). The US and China accounted for over two0thirds of the global expenditure on green stimulus during 2008-09.

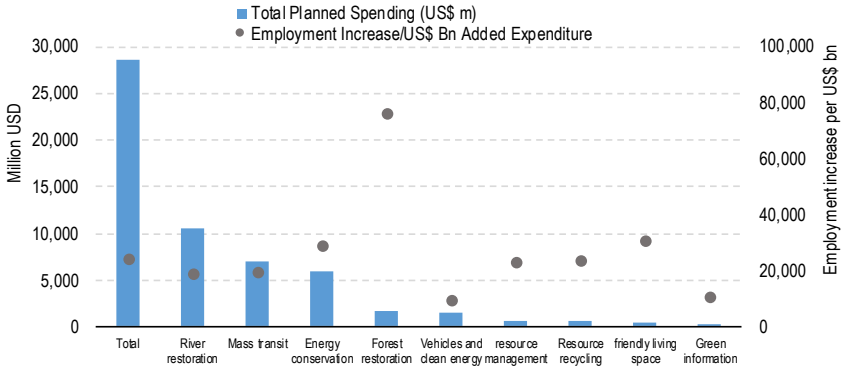
Figure 9: GFC retrospective—total green stimulus spending by country (US$bn) and share of GDP



Source: Robins et al. 2009 and 2010, Credit Suisse estimates

Green measures and investments amounted globally to around 16% of all fiscal stimulus spending by the G20 during the recession. However, only a handful of economies devoted a substantial amount of their total fiscal spending to green initiatives. The most notable exception is South Korea, which allocated nearly 80% of its total expenditure to green investments. China apportioned around a third of its total fiscal spending to green measures.

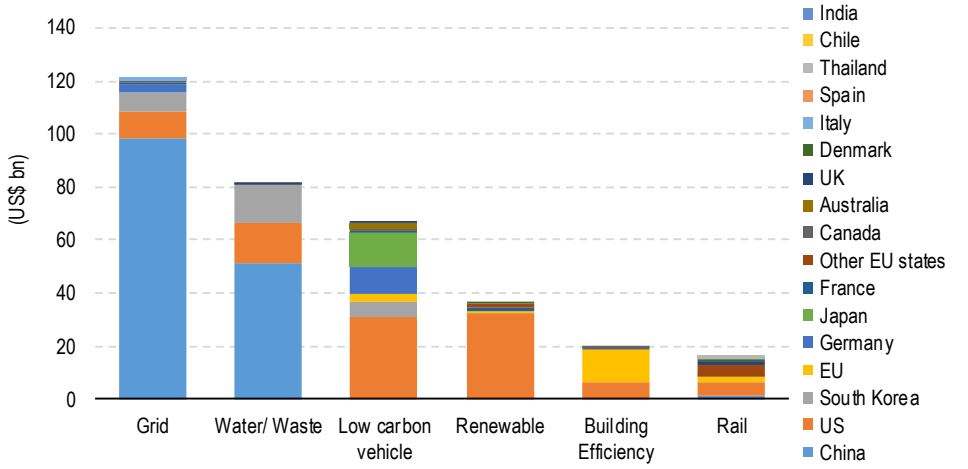
Figure 10: Employment effects of green spending items in South Korea's GFC "Green Stimulus" package



Source: Barbier, 2009, Credit Suisse estimates

More revealing, was the share of green stimulus as a proportion of GDP. Very few governments spent 1% or more of GDP on green investments during the recession. With the exception of Sweden, all these countries were from the Asia-Pacific region. Large-scale green stimulus programmes, such as the 5% of GDP in South Korea and the 3% in China, were the exception rather than the rule. The US spent 0.9% of GDP on Green Stimulus, more than the global average of 0.7%, but the European Union spent only 0.2% of GDP.

Figure 11: Summary of Green Stimulus programmes post the GFC and their respective green components



Source: Robins, Clover and Singh (2009)

An even more compelling argument this time around

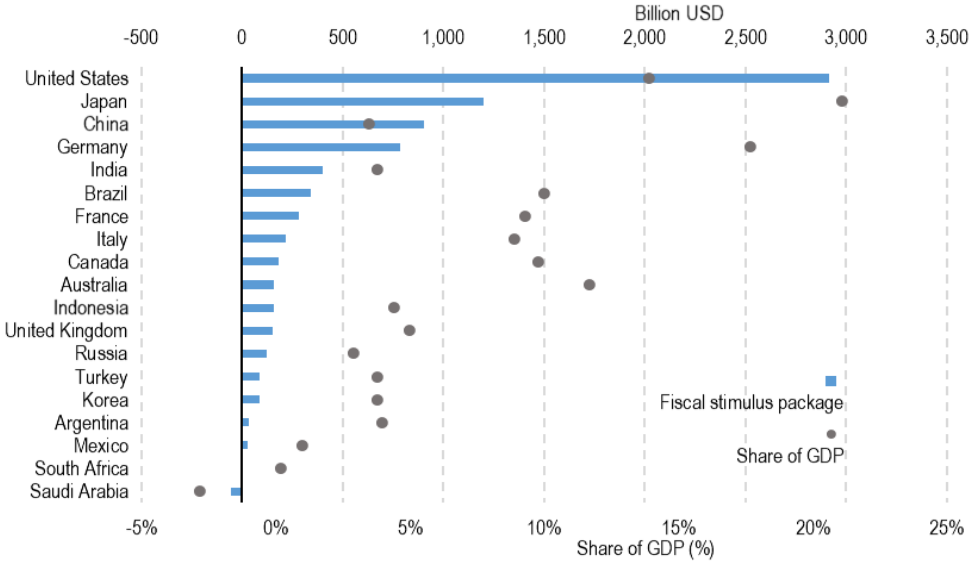
However, we think there are several reasons why Green Stimulus will see a substantial increase in funding ultimately allocated into the economy this time around.

- **Multiplier effect clearer:** Firstly, many of the economic arguments for green stimulus have since improved substantially, whereas in 2008/09 this was a less clear argument which policy-makers could confidently rely on through the then economic dislocation, when global financial stability was evidently hanging in the balance.
- **Scale, competitiveness and productivity of end markets sound:** Secondly, the acceleration in the competitiveness of green infrastructure and technology, whether in the form of battery technology, electric vehicles (EVs) or renewable energy has been substantial since 2008/09—in some cases, transformative. This makes these end-markets more competitive, both in developed and developing markets, and likely to yield improvements in the productive capacity of economies even in the shorter-term.
- **Leadership by the EU this time around:** Thirdly, since the GFC the EU has adopted a more proactive stance in relation to the mitigation of climate change across the region. While this was foreshadowed as part of the Green New Deal policy package, the EU has significantly stepped-up its green fiscal spending versus the post GFC period, increasing from US$87bn in 2008/9 to US$1.23 tn post the pandemic.
- **A more supportive monetary environment:** Central banks are responding to the COVID-19 crisis by lowering interest rates and increasing quantitative easing programmes. This means that the cost of capital in many regions has fallen, which improves the economics of new capital-intensive projects such as large-scale infrastructure. However, there has also been a large increase in capital outflows from many developing economies, where monetary action is not always easy to take, private sector co-financing ability is limited and government borrowing capacity on international markets is constrained.
- **Voter support given heightened awareness of the benefits of clean energy:** Air pollution in cities, largely linked to road transport and to oil and coal use, has major implications for health, and is a possible contributory factor in COVID-19-related mortality. Significant improvements in air quality during the lockdown period has underlined how much air pollution there is normally in many cities and the benefits of mitigating policies from here.
- **A stronger foundation for multi-lateral action:** Finally, we have also seen a substantial broadening out of government-led climate action. Since the Paris Agreement in 2016, 194 states and the EU have signed the agreement, with 188 formally ratifying into law the targets, representing more than 87% of the global GHGs. For this reason, we would expect to see an increase in countries incorporating green stimulus into their recovery plans.

Total green stimulus to date and longer term estimates

We have analysed green stimulus policies announced by governments from around the world to establish a comprehensive dataset of global policies announced to date by key funding themes. While we have collected both confirmed and unconfirmed policies, for the purposes of our assessment of the total stimulus to date, we only include those that have been confirmed and with specified funding arrangements. We note that several of the larger stimulus packages are yet to be fully allocated to funding objectives, giving scope for substantial additional policy announcements. The detailed policy and Green Stimulus dataset is available upon request.

Figure 12: Emergency fiscal measures announced by G20 countries in response to the COVID-19 crisis (US$ bn)

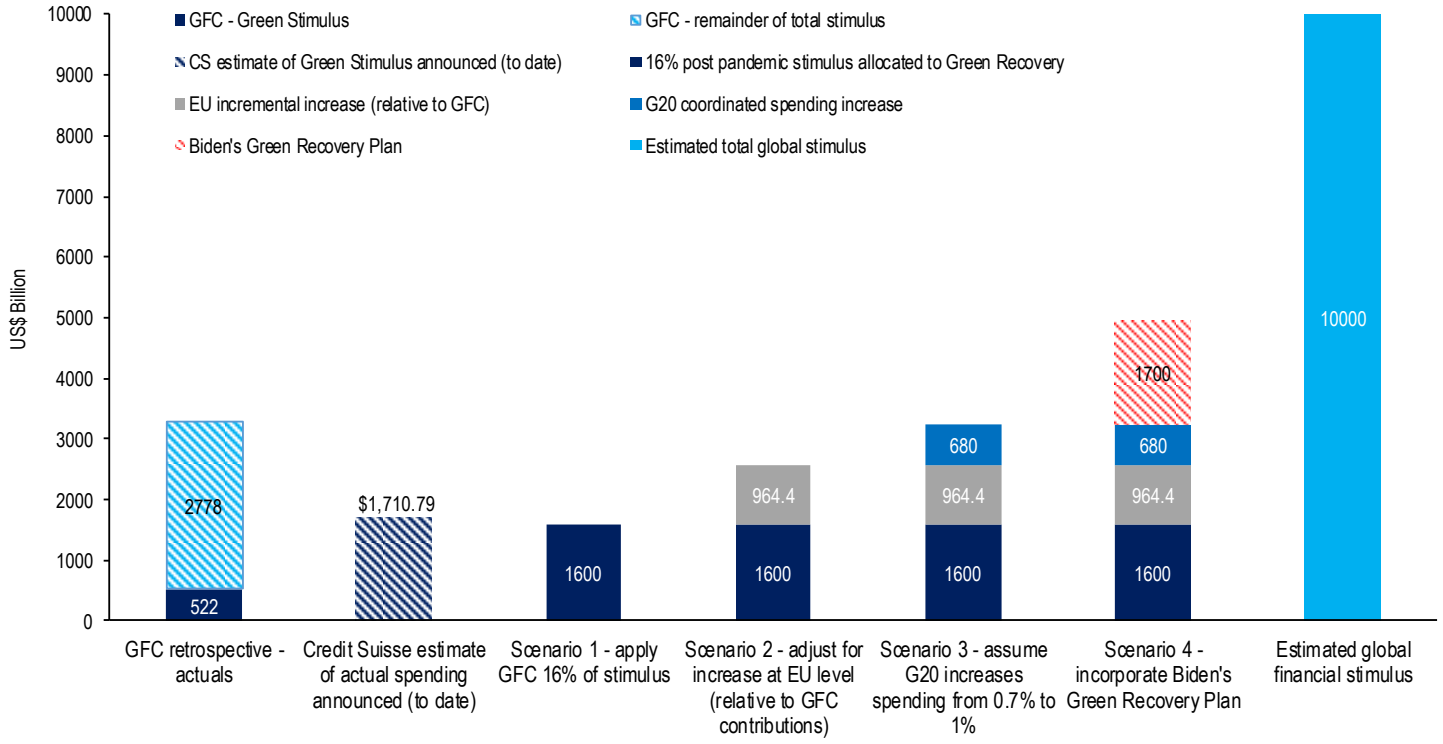


Source: IEA, IMF, Credit Suisse

- **CS estimates of total Green Stimulus to date:** We find that the current global green stimulus announced by governments has reached US$1.71tn. Of this, the majority of policies reviewed (US$1.59tn or 93%) are structured in the form of direct government spending, which suggests that funding may influence industry demand projections and green project funding more quickly than less direct tax or subsidy measures. In addition to our estimates of green stimulus to date based on our review of government announcements, we have also developed scenarios for the size of total green stimulus.
- **Scenario 1—the same proportion of Green Stimulus as post GFC:** Under the current round of fiscal stimulus announcements, the precise outlay to green fiscal spending has yet to be specified publicly. To date, however, it is estimated that between US$9 and US$10 tn has been earmarked for expansionary policies (McKinsey and IEA). Even under a very cautious assumption that the same proportion of spending as under the GFC is earmarked for green stimulus (16%), given the tentative increase in stimulus from US$3.3 tn to US$10 tn, this would amount to a tripling of expenditure from US$522 bn in 2008-09 to US$1.6 tn in the post COVID-19 green stimulus (not taking account of inflation). This is reflected under scenario 1 in Figure 13.
- **Scenario 2—the increase in EU spending relative to post GFC:** A more realistic scenario would be to take account the step-up in the EU's contribution to Green Stimulus. If we maintain the same proportionality of spending relative to GFC expenditure within the US$10 tn earmarked for economic stimulus globally now, this amounts to a notional increase in spending of US$0.96 tn from US$256bn, which would have been 16.6% of global green stimulus (which was the post-GFC EU contribution).

- **Scenario 3—greater multi-lateral coordination this time around:** However, another upside scenario to consider is the assumption of a moderate increase in global contributions as a percentage of GDP as a result of the Paris Agreement ratification. While seemingly a small move relative to GDP, an increase from the 0.7% of GDP (post GFC) to 1% of GDP at the G20 level would see the US$1.6tn base-case budget (we outline above) increase by US$680bn. Note that studies considering the possible increase in spending through coordinated action at the G20 level, find that spending would increase to between 2.2% and 3.2% of GDP. However, adding the additional EU contribution from scenario 2, would see the total green stimulus package reach US$3.2tn.
- **Scenario 4—Biden's Green Recovery:** Biden has announced an extensive list of climate and clean energy policies that include federal investment of US$1.7tn over the next ten years plus additional investment of US$3.3tn from the private sector, state and local governments. For the purposes of our scenarios analysis, we also incorporate the potential for Biden to win the US 2020 election. While the plan could result in US$5tn in overall stimulus, for the purposes of this hypothetical scenario we only include the announced federal spending, albeit this number could increase substantially with funding earmarked at the local government level.

Figure 13: Credit Suisse estimates of announced Green Stimulus (to date) and scenarios of eventual total expenditures

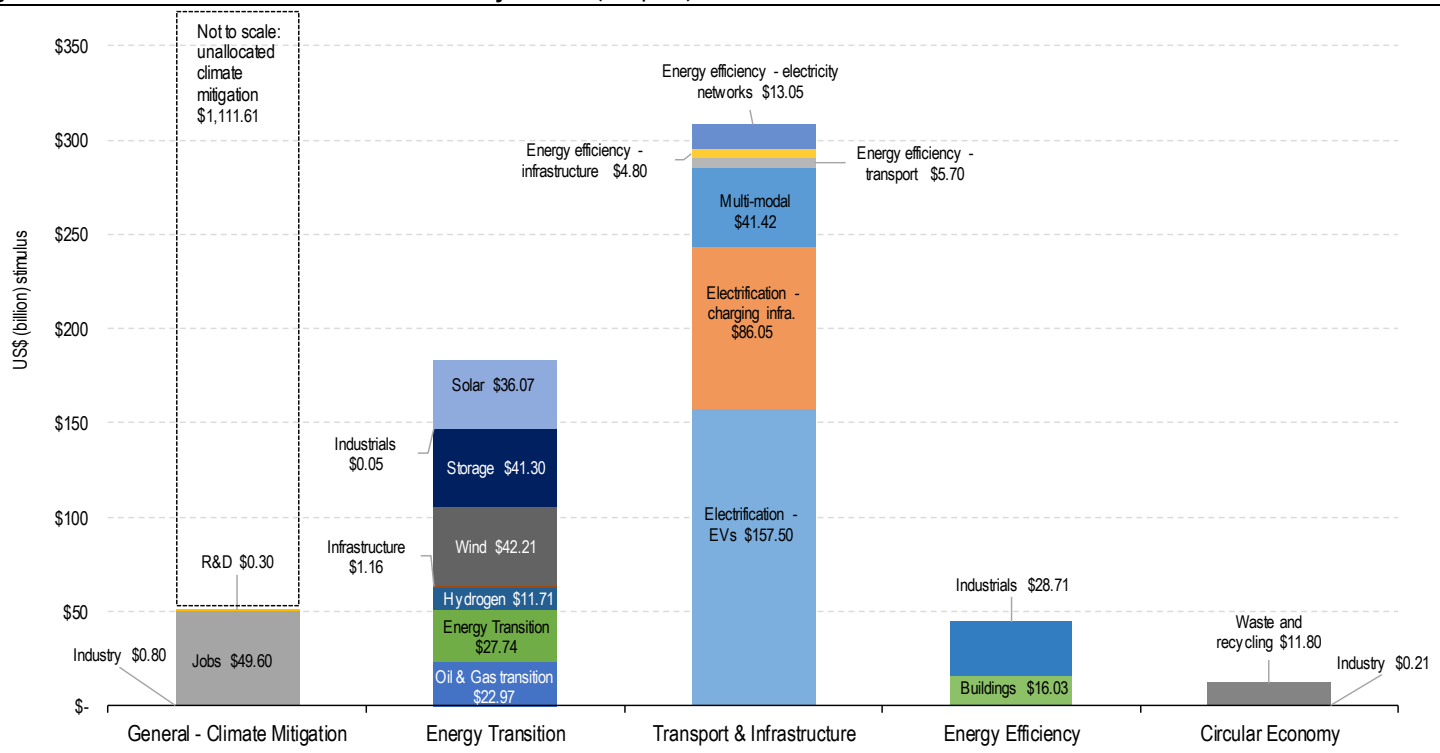


Source: Company data, Credit Suisse estimates

Confirmed Green Stimulus in numbers: CS estimates

- **Green recovery themes:** General Climate Mitigation has the greatest amount of stimulus primarily due to US$1.112tn of the EU's 'Next Generation EU' recovery package for which specific funding arrangements and themes are not yet specified (vs US$203.73bn which we have allocated into sub-themes). Excluding this, Transport and Infrastructure represents the largest theme by the amount of stimulus (US$308.53bn), followed by Energy Transition (US$183.21bn), Energy Efficiency (US$44.74bn) and Circular Economy (US$12.01bn).
- **Country breakdown:** Excluding Biden's proposed US$5tn green stimulus package in the US, the EU represents the largest stimulus package at US$1.23tn (75% of the total stimulus analysed). The second-largest stimulus to date has been announced by China at US$194.55bn of announcements followed by Germany, South Korea and Denmark (each between US$47bn and US$52bn). On the theme of Energy Transition, Denmark has announced almost as much stimulus as the EU (US$42.09bn and US$42.83bn respectively) followed by Germany, Israel and India (US$30.21bn, US$23bn and US$22.21bn respectively).

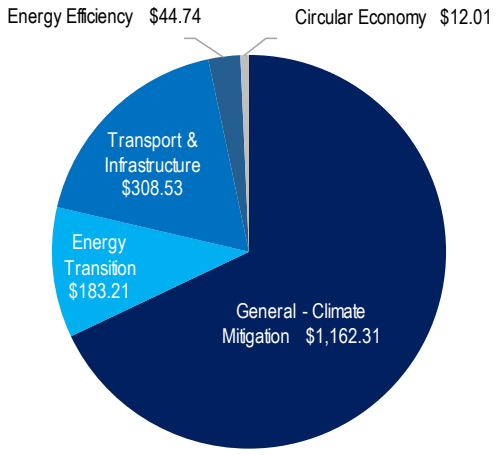
Figure 14: Global confirmed Green Stimulus by theme (US$ bn)



Source: Credit Suisse estimates

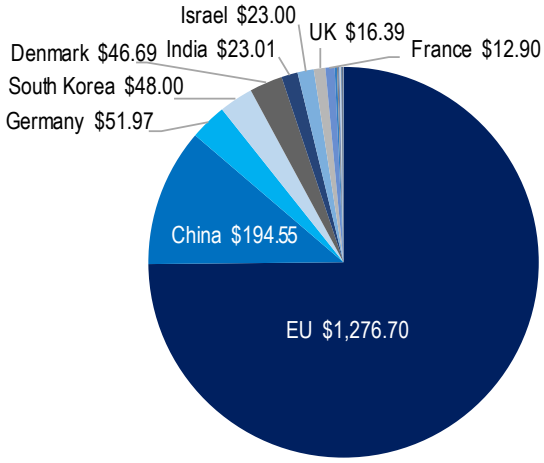
- China dominates transport policies with a total US$181.35bn worth of policies that focus on different areas within electrification including automotives, charging infrastructure and multi-modal (rail, buses and public transport). Given the level of investment compared to other nations, China could emerge from the COVID-19 recession as a global leader in electrification. Conversely, we could not find any policies from China related to energy efficiency improvements. This theme was dominated by the EU (US$16.90bn) and the UK (US$13.18bn). The UK has four different policies focusing on retrofitting housing and public buildings (schools and hospitals) along with two policies on using energy efficiency to cut emissions from vehicles and the construction industry. Denmark, the EU and the UK were the only regions/nations that have announced Circular Economy stimulus (Denmark with US$0.01bn, EU with US$11.80bn and UK with US$0.2bn).

Figure 15: Total green stimulus by theme



Source: Credit Suisse estimates

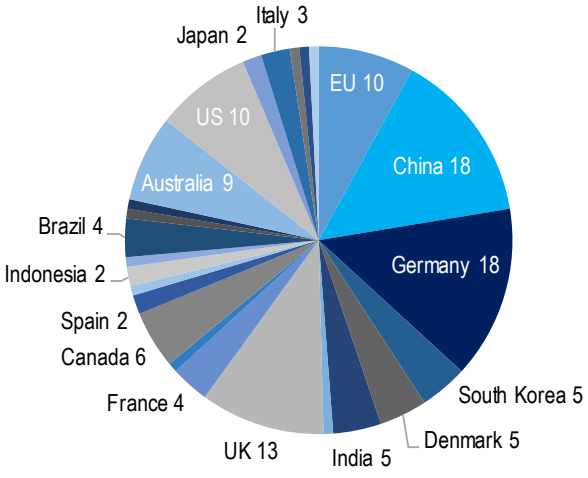
Figure 16: Total green stimulus by country of region



Source: Credit Suisse estimates

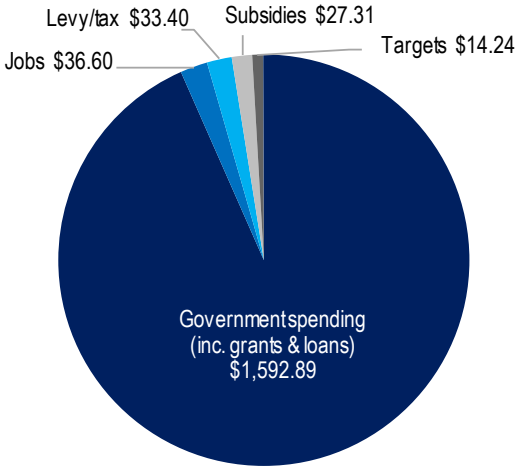
- **Policy instruments**: The majority of policies reviewed (US$1.59trn or 93%) are structured in the form of direct government spending (including grants and loans), which, to some extent, suggests that funding will influence industry and project funding more quickly than less direct subsidies. Other policy instruments include the creation of, or subsidy for, jobs (US$36.6bn); levies or taxes (US$33.4bn); subsidies (US$27.3bn); and targets underpinned by targeted funding (US$14.24bn). We note that other instruments, including subsidies and regulations (such as bans or enforcement mechanisms), do not yet have a dollar amount attached to them in terms of impact, but will still result in positive structural change for green-related industries. Announced stimulus for Transport contained a greater amount of subsidies and supportive regulatory changes than any other themes.

Figure 17: Number of policies by country



Source: Company data, Credit Suisse estimates

Figure 18: Value of policies by instrument



Source: Company data, Credit Suisse estimates

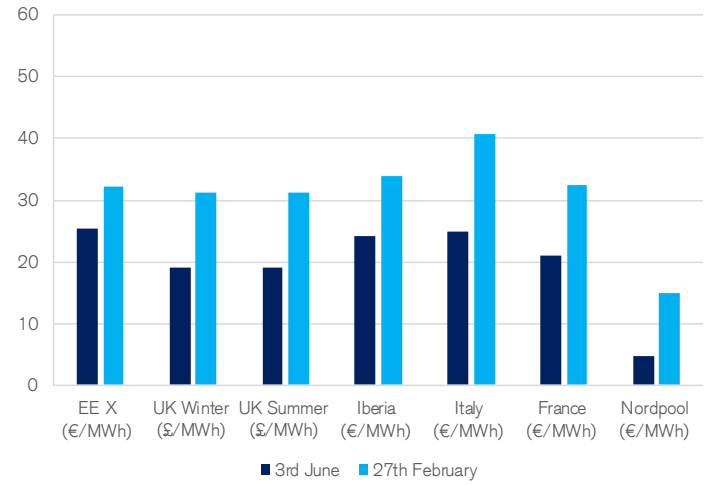
Energy Transition

Energy has not featured prominently in the COVID-19 recovery packages proposed to date. Yet the magnitude of this crisis, as well as lessons from the 2008-09 financial crisis, combined with the long-term current trajectory of global CO_2 emissions all support the case for heightening attention to the energy sector in the next phases of recovery and stimulus programmes. Investment in energy is needed if there is to be a structural reorientation of the global energy sector that enables countries to meet their long-term goals on climate change.

The impact of COVID-19

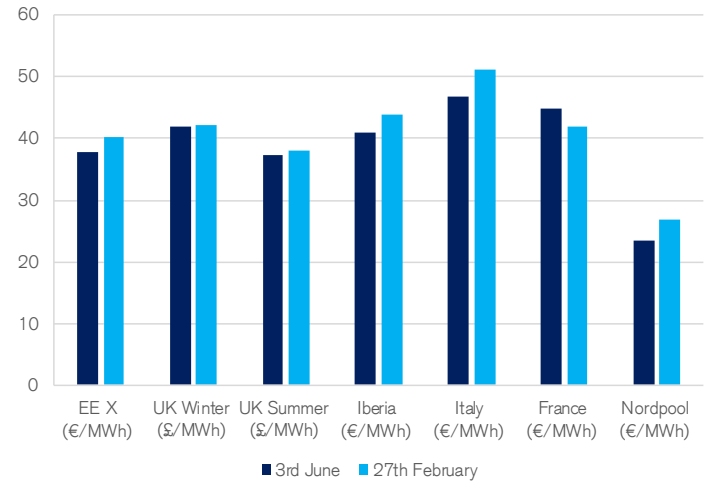
Over recent months we have gained more visibility on how Coronavirus has affected the Energy Transition. While the Oil & Gas industry has reacted to the weak oil macro with discipline (e.g., suspension of buybacks, cuts to capex, further opex savings, and changes to dividend policies), the global outlook for renewables was also affected by Coronavirus. Weak spot power prices during the heart of the pandemic, as well as restrictions resulting from social distancing requirements led to delays in construction of projects as well as in permitting. The former issue, in particular, highlights the risks of merchant-exposed generation in Europe; it has been noted by Endesa CFO Luca Passa that Spain's 2030 renewables targets are hard to achieve with power prices below €50/MWh (however Spain is looking to introduce legislation by the end of the year for difference power price setting mechanisms as renewables becomes a larger share of power generation, which may address this long-run risk).

Figure 19: EU spot power prices—weakness during pandemic



Source: the BLOOMBERG PROFESSIONAL™ service

Figure 20: EU 2021 forward power prices remained robust

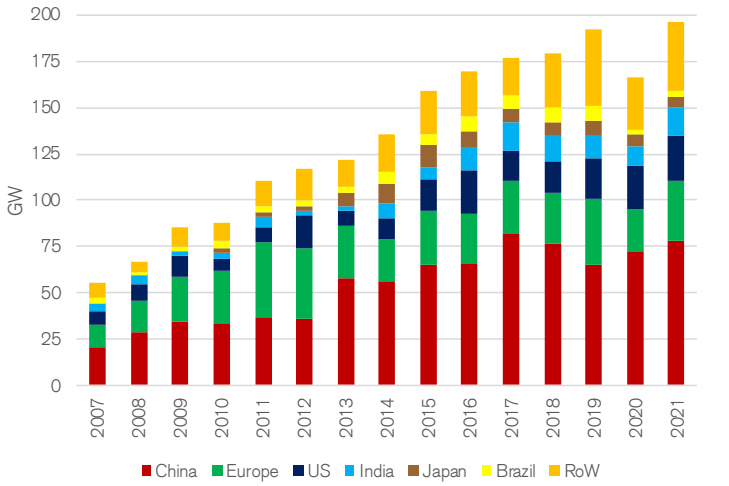


Source: the BLOOMBERG PROFESSIONAL™ service

The IEA has also provided several updates on its outlook for 2020. First, we have seen a revised 2020 and 2021 outlook for renewables. The IEA has trimmed its 2020/21 renewables growth forecasts by 10%. For the first time since 2000, capacity additions will decline YoY, by 13% for 2020 (to 167 GW). 2021 is forecast to rebound (helped further by delayed projects materialising), surpassing the 2019 level of capacity additions just short of 200 GW (see Figure 21). We note, however, that geographically, China and the US are forecast to maintain or increase installations in 2020; decline is seen in Europe (~13GW fewer installations), alongside other geographies (also ~13GW lower) and Brazil (~6GW lower).

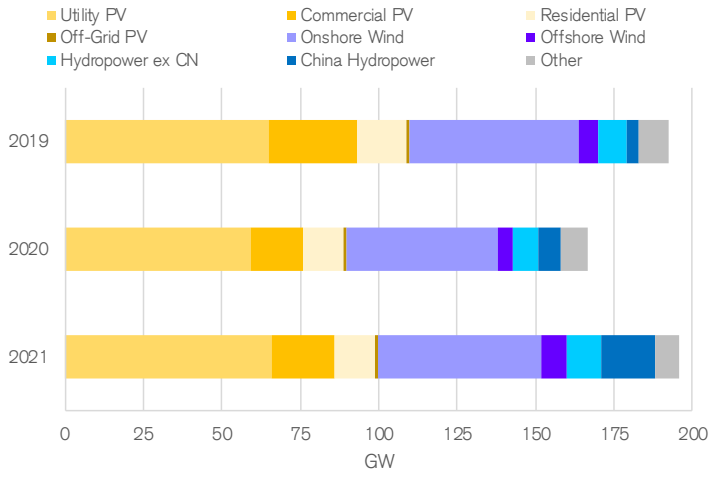
Despite this, investment into Energy Transition has remained more resilient than the broader Energy sector, based on the IEA's 2020 World Energy Investment report. This year the IEA expects energy investment to decline 20% YoY. However, investment into clean energy (renewable power, transport and heat, nuclear, battery storage) is expected to only decline 10%, and investment in energy efficiency by 12%.

Figure 21: IEA renewables forecasts—geographic breakdown



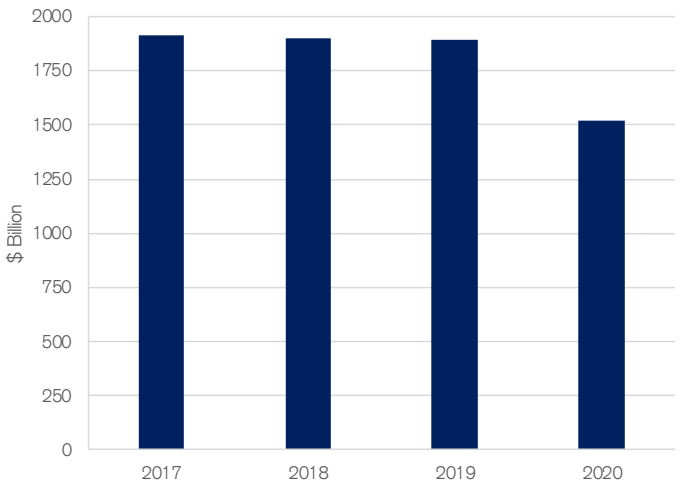
Source: IEA

Figure 22: IEA renewables forecasts—technologies



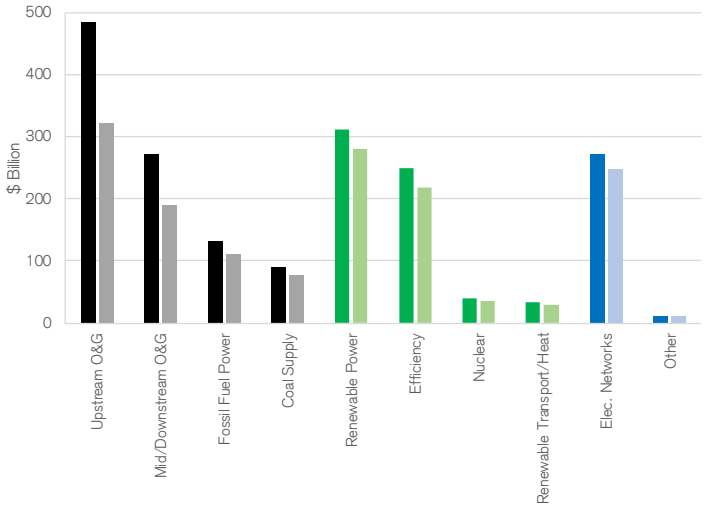
Source: IEA

Figure 23: IEA global energy investment forecasts



Source: IEA

Figure 24: IEA energy investment forecasts—breakdown by sector (2019: left, 2020: right)



Source: IEA

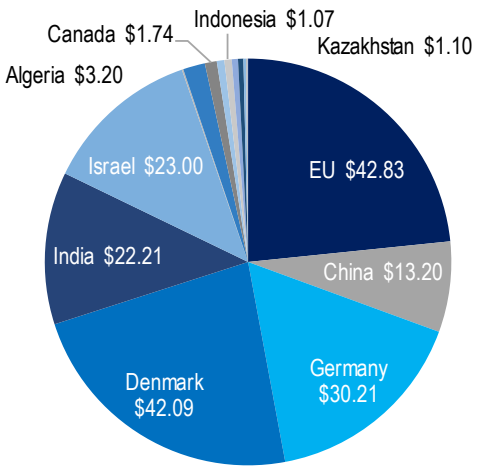
Energy transition stimulus policies

The Energy Transition theme is broken up into eight different sub-themes with wind seeing the greatest level of government stimulus (US$42.21bn), followed by energy storage (US$41.30bn), solar (US$36.07bn), general renewables (US$27.74bn) and general O&G transition (US$22.97bn)—e.g. fuel excise duties and remediation of contaminated wells.

- **Explosion of renewable energy in nations with low current capacity:** The green stimulus dataset highlights the extensive expansion of renewable energy globally, particularly in countries that currently have low capacity, for example, Algeria's five-year solar plan that will install ten times the current capacity; Zimbabwe's 500MW of solar rol- out (50% increase on current capacity); and the Australian state of NSW's renewable energy zone that will be 9x current capacity. Of all Energy Transition policies in our dataset 81% are in the form of government spending; we believe the pandemic represents a critical juncture as governments move away from stating targets towards more direct interventionist investment measures, a positive signal for the renewable energy sector.

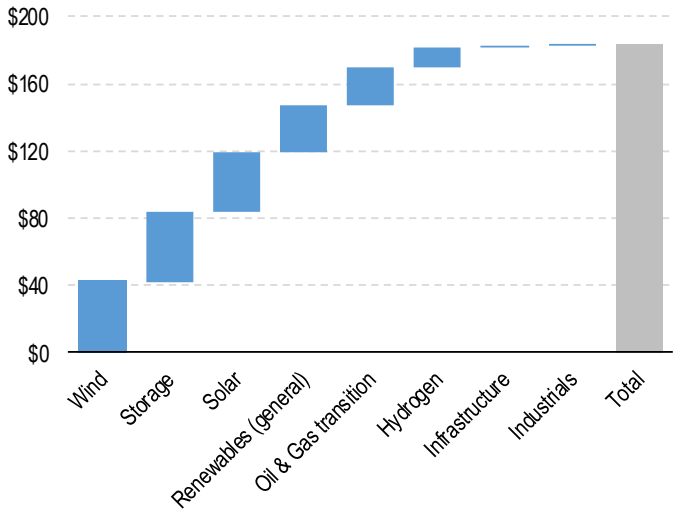
- **Disadvantaged communities to benefit from small scale renewable projects:** Regions that are either currently not connected to the grid or are located in low socioeconomic areas have been prioritised by various governments, including through Brazil's 'More light for the Amazon' programme; Indonesia's Solar Archipelago plan; and Biden's proposed clean energy projects for disadvantaged communities. These projects indicate that renewable energy is experiencing organic growth in new markets in addition to taking share of fossil fuel electricity generation.
- **Biden/Democratic win biggest upcoming catalyst:** A Biden win along with a Democratic sweep in House and Senate would transform renewables' policies and demand in the US. We expect residential solar companies to benefit the most given limited competition for project returns/pricing and ability to capture any higher tax credits for solar and storage, and a strong customer base that could accelerate battery storage adoption under any new tax credits for standalone battery storage systems. As we highlighted in our note (8/2—Factoring in Biden Upside), we estimate that the stocks embedded a 33% probability of tax credit extension in late July.

Figure 25: Energy transition green stimulus by country (US$ bn)



NB: Chart does not show countries with < $1bn (UK, Malaysia, Brazil, Australia, US, & Japan)
Source: Credit Suisse estimates

Figure 26: Energy transition green stimulus by sub-theme (US$ bn)



Source: Credit Suisse estimates

Drivers of Energy Decarbonisation

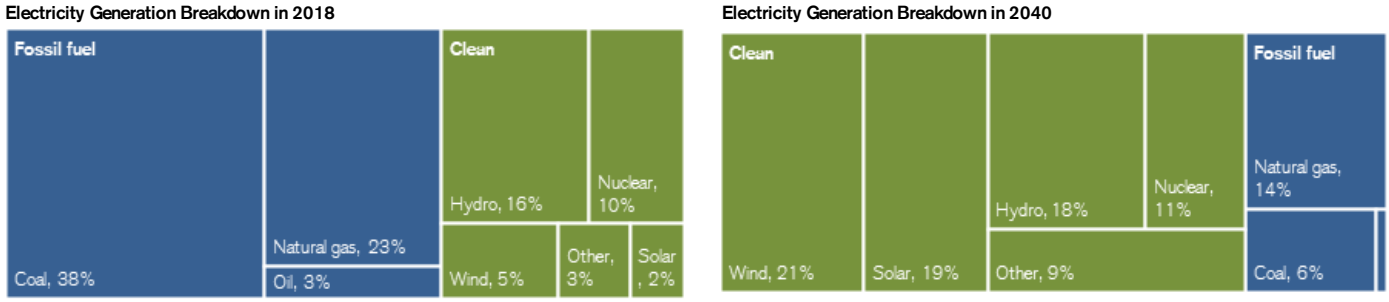
The path to reduce energy-related emissions requires two fundamental shifts in how the world generates and consumes energy: rising share of renewable energy sources to *generate* electricity and increasing consumption of that electricity…both in lieu of fossil fuels. And with the power (generation) and transportation (consumption) sectors accounting for a combined two-thirds of global energy-related CO_2 emissions, the energy transition only happens by shifting the former to renewables and the latter to electrification/low-carbon fuels. Energy efficiency (i.e., reducing the overall energy consumption needed to support the world's economy) and electrification of other industries also play critical roles.

Power sector shifting to renewables

Reducing the carbon intensity of electricity supply with renewable energy is the most impactful shift that can occur in the current energy supply chain as the power generation sector accounts for ~38% of the final energy consumption and is the largest contributor of global energy-related CO_2 emissions at ~42%. Given limited appetite for nuclear power, the mix shift from fossil fuel to zero-emission sources (e.g. wind and solar) is the key driver decreasing the carbon intensity of electricity supplied. The magnitude and speed of this shift ultimately boils down to economics. BloombergNEF estimates that solar and onshore wind are now the cheapest sources of *new* bulk power generation in countries that make up two-thirds of the world's population and 85% of electricity demand.

Under its Sustainable Development Scenario, the IEA expects global carbon emissions from the power sector to *fall* by >70% even as electricity generation *grows* by 46% from 2018 to 2040. This is enabled by wind and solar reaching a combined 40% of the global electricity generation mix by 2040, up from 7% in 2018 (Figure 27). And the IEA forecasts the share of renewables as a whole will account for about two-thirds of the global generation mix by 2040 with the vast majority of this growth coming from wind and solar. Renewable energy sources will be taking market share from coal and natural gas which supplied 38% and 23%, respectively, of global power generation in 2018.

Figure 27: Global electricity generation mix in 2018 vs 2040E(1)



(1) 2040 forecasts are based on the IEA's Sustainable Development Scenario

Source: International Energy Agency

Electrification of transportation & industries

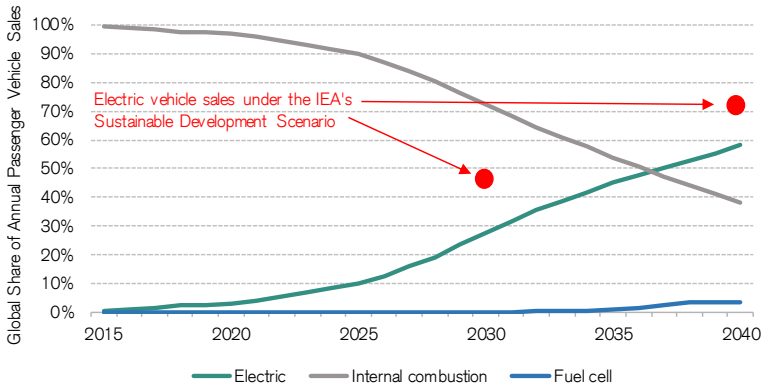
Transportation accounts for ~20% of global energy demand and is the second-largest contributor of global energy-related CO_2 emissions at ~25%. It encompasses all means of transport including road, aviation, marine and rail. But given differences in the availability of scalable electric technologies, light-duty passenger vehicles see vastly different demand and emissions trajectories (at least for now) for the next several decades compared to other transportation segments.

Supported by falling battery costs and government policy pressure, electric vehicles (EV) are replacing passenger internal combustion engine (ICE) vehicles at an accelerating pace in certain countries (primarily Europe and China). EV/hybrid cars reached 2.1 mn in annual sales in 2019,

or ~2.5% of the overall vehicle sales market. BloombergNEF forecasts global electric vehicle sales will be >10x the 2019 sales level by 2030, hitting ~28% of total passenger vehicle sales in 2030 and ~58% in 2040 (Figure 28). However, an even more aggressive pace of adoption is needed under IEA's Sustainable Development Scenario, where it sees EV sales as a percentage of new car sales growing to 47% by 2030 and 72% by 2040.

Electrification of end-user energy demand is also an important driver and it has wide-spread implications across sectors. While this transition is occurring most rapidly in the transportation sector as noted above, it's also happening in the buildings sector (e.g. electric-powered heat pumps for heating), and to a lesser degree, the industrial sector (e.g. steel production shifting from blast furnaces to electric arc furnaces, electric boilers). Electrification will have the most meaningful impact in sectors with a large energy footprint and low electricity penetration.

Figure 28: Global % share of annual passenger vehicle sales forecast by type



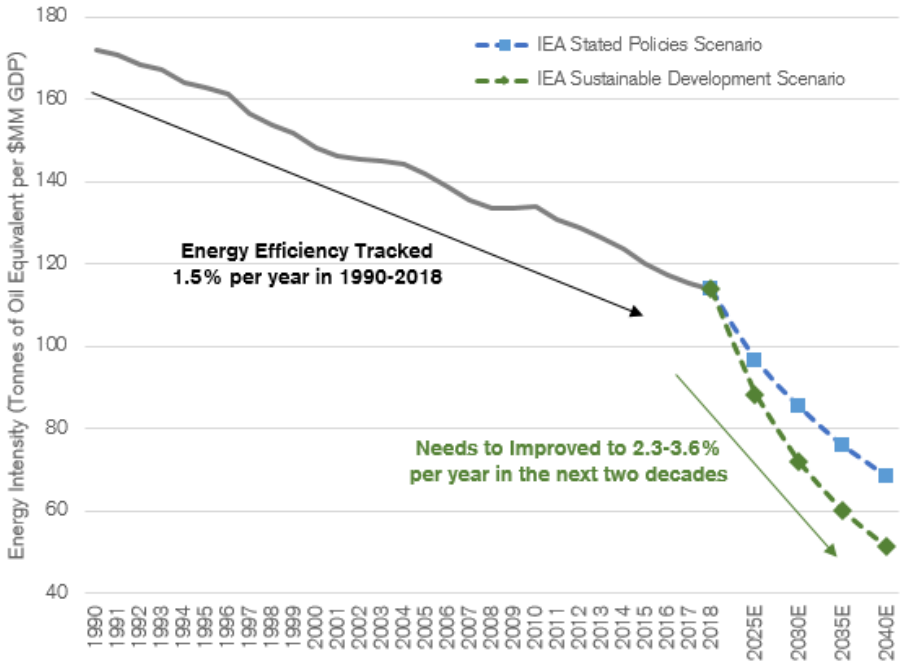
Source: BloombergNEF, International Energy Agency

Improving energy efficiency

Reducing *demand* of energy through efficiencies is complementary to shifting of *supply* to cleaner energy sources. It encompasses a vast range of subjects from efficiency measures on appliances, buildings, and industrial equipment, to fuel efficiency of vehicles and planes, to "smart" electricity usage to maximise use of wind/solar energy. For example, while there is currently no economic substitute for jet fuel, new fleets tend to have ~15-20% better fuel efficiency than the ones being replaced. Airlines are highly encouraged to make the steep investment in new planes in order to meet increasingly stringent emissions regulations.

Given the scale of the transition, the idea of "doing more with less" is an essential part of the solution particularly given expectations for a growing global middle class and 20% increase in global population by 2040. Looking at energy intensity (measured by energy consumed per GDP generated), implied global energy efficiency has been tracking at ~1.5% p.a. since 1990 but needs to increase to 2.3% and 3.6% p.a. over the next 20 years under the IEA's Stated Policies Scenario and Sustainable Development Scenario, respectively (Figure 29). While these are seemingly small numbers, the ~1.3% difference in annual energy efficiency gain equates to a ~25% difference in *total energy consumption* over 20 years between the two scenarios.

Figure 29: Historical and forecasted Global Energy Efficiency (1990-2040E)



Source: International Energy Agency, The World Bank

Oil & Gas majors: the pivot begins

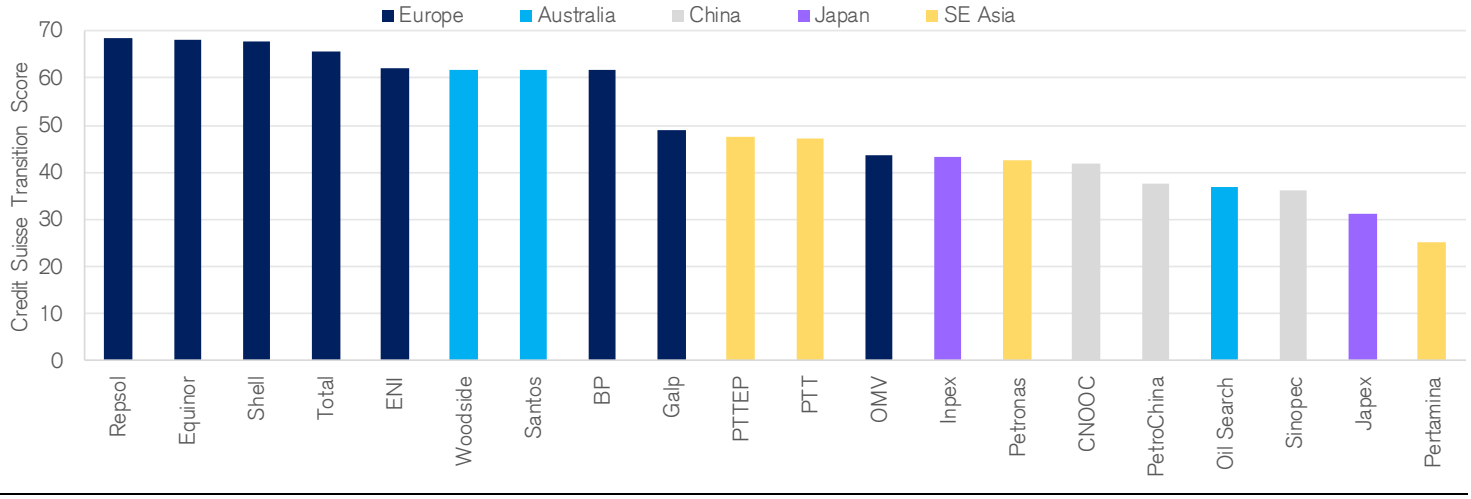
Overall we have seen companies' strategies on Energy Transition remain resilient through the pandemic, if not strengthening. With respect to capex, companies' low-carbon allocations were not affected as their projects are longer term (we note Equinor's Offshore Wind pipeline). Other companies such as BP and Total have maintained the absolute value of their low-carbon capex for 2020 (with Total now indicating the top of its previously guided low-carbon capex range for the year). Some such as Repsol and Shell have indicated that parts of their capex reduction have come from divisions containing their renewables assets with no greater split described (see Figure 32 for further details), but these companies have still remained active in bidding on renewables projects and continuing development of renewable pipeline assets. **We outline the key Energy Transition developments at the European O&G majors in the Appendix.**

While all EU Oils are progressing with their Energy Transition strategies, our European Oil & Gas research team has developed a unique approach for quantitatively assessing the alignment of Oil companies with Energy Transition. This takes the form of a bespoke, peer-relative score to evaluate companies on a careful selection of 25 metrics related to Energy Transition. This incorporates information such as portfolio data (breakeven levels, gas % production and reserves), renewables portfolios (capacity, pipeline, capex), Transition targets (on emissions, gas, renewables, and low-carbon investment), management incentives, and emissions-related metrics to name a few.

Our approach has several advantages versus third-party ESG scores: We focus on the energy transition subset, which is more directly linked to long-term sustainability, and this focus can have a large impact: we note that some companies with low Transition Scores have high ESG scores from leading providers. We incorporate forward-looking metrics to partly capture 'ESG momentum', an important indicator alongside standard scores. We curate the data for a smaller, more focused set of material and comparable metrics: we are able to use sector-specific metrics that are relevant for transition, and unique metrics that are not available from other data providers, as well as avoiding binary variables. We strive to be transparent with our approach, detailing our methodology and results in previous reports.

In our latest publication, we applied our Scorecard to a selection of 20 EU & APAC Oils, with the results of our Transition Score methodology shown in the chart below (note that these results are as of our last publication of this report on 15th July, and thus do not take in to account developments since then that would affect the Transition Score). Refer to our latest update report for full details on our Scorecard.

Figure 30: Credit Suisse Transition Score—EU and APAC Oils (as of 15th July 2020).



Source: Credit Suisse.

Of EU Oils, **Repsol, Equinor and Shell lead**. These companies remain our top 3 scores since our first publication in January 2020. However, Equinor improves to 2nd with its strategy update significantly improving its score. Total, while still 4th, has halved the gap in Transition Score to the top 3. ENI and Galp improved one position each (EU relative), displacing BP and OMV respectively. If we only consider our renewables metrics, Repsol, Galp and Equinor score highest (Shell, Total, and BP rank lower as a result of scaling our renewables metrics to better capture materiality).

Beneficiaries of green stimulus

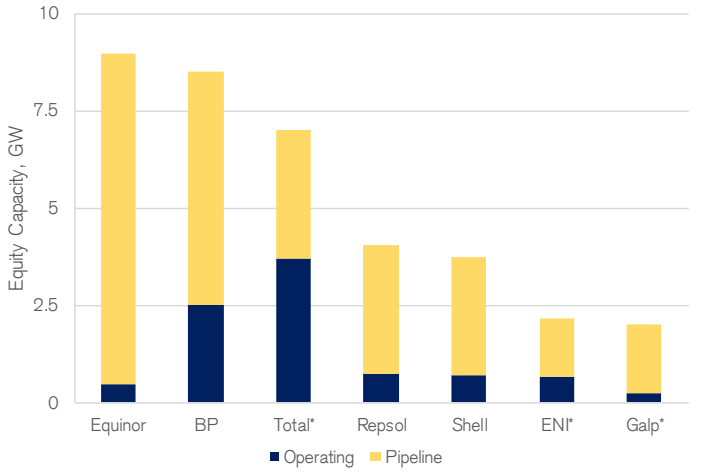
In general, the strategies of the European IOC's with respect to Energy Transition are novel, with renewables in most cases much less material than the Oil & Gas operations of companies. However there is room for all companies to benefit from the new stimulus in order to develop their low-carbon operations.

First, we examine which companies have the largest existing renewables portfolio and pipelines (i.e., any element of incumbency advantages); this demonstrates experience and competency in renewables, and thus may be a competitive advantage versus peers when accessing grants/ loans from the EC (as opposed to a reliance on farm-ins to grow capacity).

- Here we note that Equinor has developed a significant offshore wind pipeline (8.5GW equity capacity), despite having lower current installed capacity than peers.
- BP's portfolio is significantly supported by its 50% ownership stake in Lightsource BP, providing a 6GW pipeline of solar assets (equity basis to BP); this in support of BP's existing operational renewable equity capacity of 2.5GW.
- Total, through its significant M&A activity in 2020, has increased its installed capacity and pipeline dramatically to gross 5.1GW and gross 4.8GW respectively. Total does not provide equity-basis numbers like peers (indeed its 2025 target is also not on an equity basis); however, we attempt to estimate equity capacity (with the adjustments described in the table below).

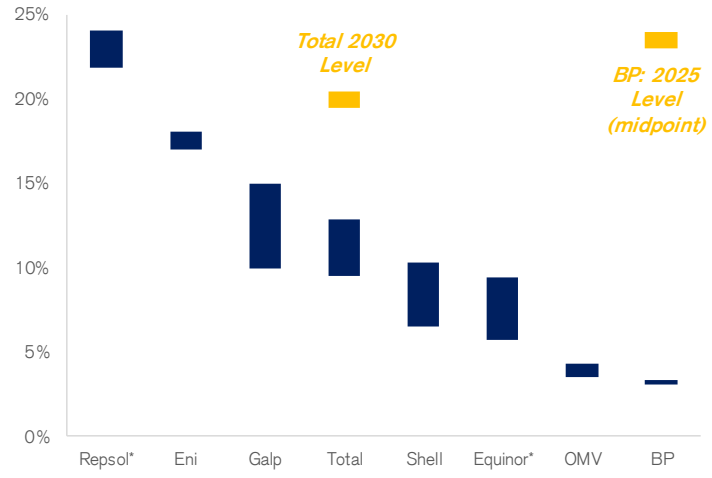
- Shell may also see some advantages, as its pipeline now contains four offshore wind projects—a technology which has prominence in some countries (we note Germany's new offshore wind targets and the emerging Polish market).

Figure 31: EU IOCs—renewables equity capacity comparison



* Total is estimated equity capacity (vs Gross reported). Galp represents assets from ACS deal. Source: Company data, Credit Suisse estimates

Figure 32: Short-to-medium term low-carbon capex allocation as well as longer-term indications (BP, Total).



* Equinor shown on a cash basis (50% of gross). Repsol is 2020 only (2025 strategic plan to be announced). Source: Company data, Credit Suisse estimate

Second, we note any experience that companies have in technologies that are at present not commercial; such as CCS or clean hydrogen. The grant elements of the JTM will only be eligible for projects that would otherwise not be financed on commercial terms. Thus again, displaying a competency in these technologies (particularly developing larger scale projects) may be an advantage in accessing these funds.

- Here we note Equinor's leading CCS footprint compared to peers, with an involvement in 40 CCS projects; this is out of a total of 59 current global projects according to the Global CCS Institute.
- We also note Shell's experience in hydrogen, having operated for nearly three decades and with two notable recent announcements; Europe's largest green hydrogen project NortH2, and the recently awarded HKN offshore wind project with Eneco, which would be integrated with green hydrogen production.

Figure 33: Overview of renewables assets and some projects in key technologies

	Renewables Capacity	Renewables Pipeline	CCS Projects	Hydrogen Projects	Biofuels
BP	Equity: 2.5GW (0.9GW US Wind, includes 50% share of Lightsource)	Equity: 6GW (as of Dec 19: Lightsource pipeline 'in excess of 12GW')	Net Zero Teeside, In Salah, Moomba projects	Western Australia (up to 1 mtpa H2-based ammonia)	BP Bunge Bioenergia (32 mmtpa sugarcane crushing capacity); 1.5 bn liters ethanol annual production.
ENI	Equity: ~0.25GW	Equity: ~1.75GW (including 1GW Equity via Falck Renewables)	Ravenna, and Net Zero Teeside projects.	Two partnerships with Toyota (fuelling stations); agreement with City of Venice to develop a hydrogen platform	Gela and Venice biorefineries: 1.1 mtpa capacity (0.72 & 0.36 mtpa respectively).
Equinor	Equity: ~0.5GW. Gross: ~1.3GW.	Equity: 8.5GW (includes100% Empire, Beacon). Gross: ~12.5GW.	Part of 40 projects	Magnum power plant conversion; H-vision (blue); Zero Carbon Humber; H2H Saltend	
Galp	Equity: 0.68GW (75% of ACS venture)	Equity: 1.5 GW (includes 75% of ACS venture)			Sines refinery (~30 kt HVO in 2019) and Enerfuel (25 ktpa biofuel capacity).
Repsol	Equity: ~0.75GW (Predominantly Hydro, ~0.7GW)	Equity: ~3.3GW (of which ~2GW in Iberia, ~1.3GW in Chile)	Member or OGCI (Net Zero Teeside)	SUN2HY project (with Enagas)	Biofuel capacity of 871,000 m3/year
Shell	Equity: ~0.7GW	Equity: ~3.0GW.	Part of 7 Projects	NortH2 (Green H2 of 800ktpa by 2040); Tweede Maasvlakte plant (50-60,000 kg/day); H2 Mobility Germany	Raizen (50%); 2.5bn litres annual ethanol prodn. Raizen Ethanol Plant: 19.5m liters biofuel in 2019.
Total	Gross: 5.1GW. Excl. non-equity share of Eren (70.4%), sale to Banque de Territoires (50%): 3.8GW	Gross: ~4.8GW. Equity: ~3.3GW (incl. 100% GWP, Solarbay, French Solar tender).	Northern Lights, Net Zero Teeside, Acorn, Aramis projects.	Pilot project at Leuna refinery (with Sunfire, incudes Methanol); H2 Mobility Germany (H2 stations);	2019 prodn: 0.24 Mt. NB La Mede refinery conversion (0.5 mtpa, June 2019 start).

Source: Company data, Credit Suisse estimates.

Finally we also assess the capex plans for companies in low-carbon. As indicated from EC documents, this stimulus also aims to prompt significant amounts of private capital toward these industries. For this, we assess the capex plans of the European IOCs, taking into account previous low-carbon capital allocations, as well as any changes to this guidance with recent strategy updates or any changes to 2020's allocation resulting from Coronavirus.

- We thus see this data as informative for the medium-term willingness to spend on Energy Transition. However we note that this can increase over time: both BP and Total indicate higher low-carbon capex shares in the future (as shown on the above chart), and ENI for example recently increased their low-carbon capital allocation for the coming years.
- One potential driver of this is whether these plans could increase with new fiscal stimulus: Enel for example has highlighted that the new stimulus could drive higher European investments (with more detail to potentially come at their November business plan update as highlighted by our Utilities team). We expect that fiscal stimulus could indeed support Oil & Gas companies' transition strategies—with ENI's CEO Descalzi noting that the company is considering potential access to mechanisms such as the innovation and recovery funds.

Figure 34: O&G—CS Neutral or Outperform rated stocks with highest ratings on our proprietary Energy Transition Scorecard

Company	TP	CS TP Upside	CS Rating	MC (US$ bn)	PE		Sales	Earnings	Quality	Momentum	Business Sustainability	Refinitiv ESG Momentum
					12MF	12MF/5Y median	Consensus '20-22' CAGR		Percentile rank			
Total	€41	23.9%	O	103.9	16.8	43%	5%	73%	9	34	43	0.0%
BP	p400	40.99%	N	75.3	32.2	112%	15%	na	15	7	51	0.0%
Equinor ASA	Nkr215	50.24%	O	52.3	20.5	32%	18%	71%	12	68	44	0.3%
ENI	€10	16.88%	N	35.0	46.4	136%	15%	na	14	21	38	4.0%
Repsol	€14	97.95%	O	13.1	9.1	-13%	15%	75%	7	19	44	15.0%
Galp Energia	€14	53.33%	O	9.2	20.5	9%	15%	85%	13	22	42	13.3%
Shell Midstream Partners LP	US$12	5.63%	N	4.5	7.6	-52%	6%	9%	na	na	50	na

Source: Company data, Credit Suisse estimates

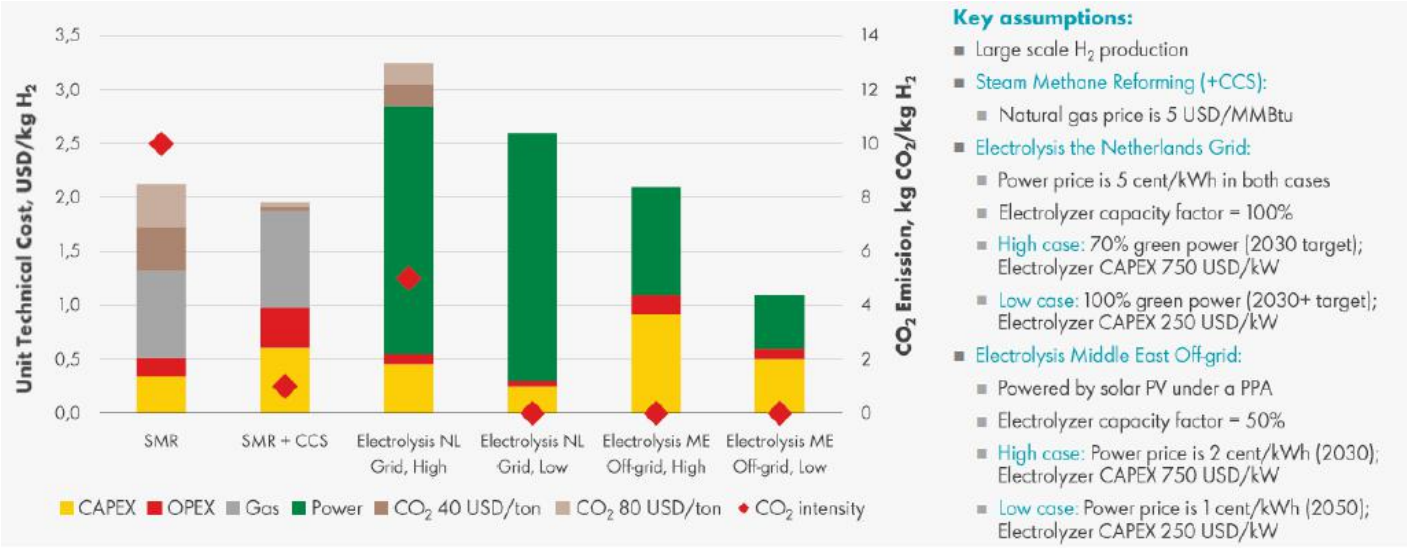
Hydrogen

There is a clear trend towards developing clean hydrogen globally, with US$11.71bn of policies to support hydrogen announced by governments to date. Germany has announced the largest hydrogen stimulus with US$9.91bn going towards 5GW of capacity by 2030 and potentially another 5GW by 2035. The EU has proposed US$1.53bn of investment in hydrogen and will fast track its Clean Hydrogen Strategy and Alliance. The French government will announce its industrial recovery plan in Autumn 2020 which is set to include developing domestic hydrogen, with hydrogen industry body, AFHYPAC, calling for investment of €24bn (US$29bn).

A new study from a group of eleven utilities assessed the feasibility of European hydrogen network infrastructure. To reach 23,000km of hydrogen networks by 2040 across ten European countries, total investment would need to be between €27bn and €64bn (split 60% pipelines and 40% compression stations), assuming 75% of the network could be retrofitted gas pipelines. Retrofitting is estimated at 10-35% of the cost of building new pipelines. Hydrogen operating costs are estimated to vary between €1.6bn and €3.5bn per year.

The paper follows on from recent EU announcements supporting green hydrogen, including installing 6GW of electrolysers to produce 1mn tonnes of green hydrogen by 2024, scaling up to 40GW between 2025 and 2030; and decarbonising other sectors, such as chemicals and steelmaking, using green hydrogen. Retrofitting 6,800km of gas pipelines around green and blue energy hubs in Belgium, the Netherlands and North West Germany, is the first of three key phases laid out in the study. The second phase would involve new infrastructure connecting Central Europe to regions with abundant renewable generation capacity, requiring hydrogen storage facilities. The last phase would be the creation of pan-European hydrogen infrastructure by 2040, able to meet 1,130TWh of demand.

Figure 35: Scenarios for unit technical cost of hydrogen after 2030



Source: IEA, McKinsey, Royal Dutch Shell

Thematic drivers

- **The molecule of the future.** Of EU-28 primary energy demand, 6 times as much energy is currently 'molecule-based' as opposed to electricity-based. Rapid renewables growth is decarbonising electricity, but molecule-dependent end-markets remain a challenge to which hydrogen can provide a solution. Key end-markets are: **Energy Storage,** converting excess renewable generation into a molecule-form (addressing intermittency issues); **Transport fuel**, particularly where an electrification is not suitable; **Industrial Heat & Feedstock,** for example in the steel, cement and refining industries; and **Residential Heat** where hydrogen can be blended with domestic gas (up to 15-20%).

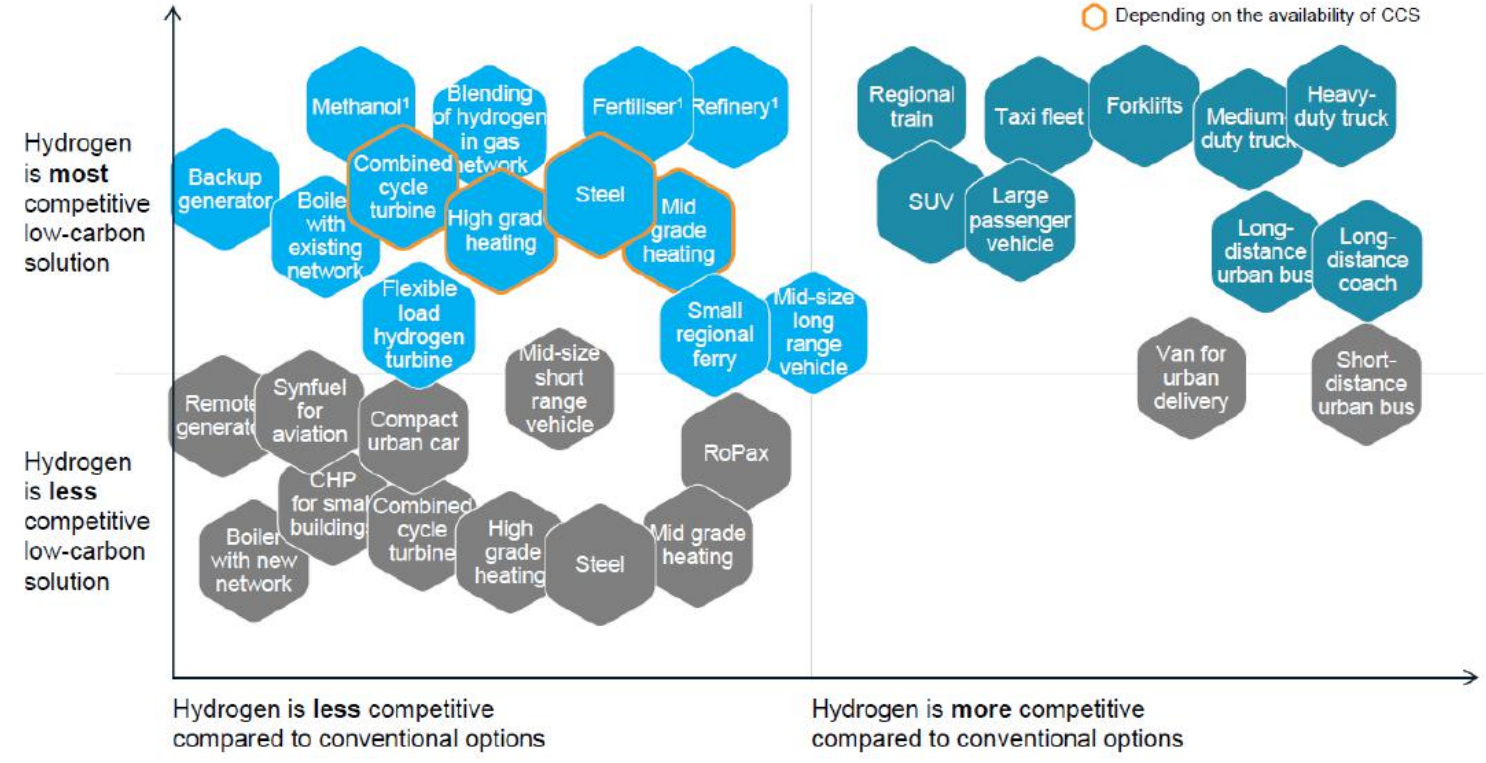
- **The cost pathways for low-carbon H_2 production are now much clearer.** Hydrogen is not a new product: global production is currently 70mtpa. However ~75% of hydrogen is currently produced from natural gas ('grey' hydrogen), which has a significant emissions profile. Renewable power generation can produce cleaner 'green' hydrogen via electrolysis, or a CCS solution can be added to grey hydrogen production to dramatically reduce the emissions footprint (potentially 90%), referred to as 'blue' hydrogen. According to IEA/McKinsey, by 2030 blue H_2 (SMR+CCS) could be competitive with grey H_2 at a unit cost just below $2/kg, if we see carbon prices increase to $80/t. However with a carbon price of $40/t, grey H_2 remains marginally cheaper, just below $1.75/kg. For green H_2, the most significant lever determining the cost competitiveness is the price of renewable power (more so than capex).

- For example, scenarios for grid-based power in the Netherlands in 2030 indicate that costs of green H_2 could range from $2.5-3/kg. Comparatively, scenarios with off-grid PPA solar in the Middle East could produce green H_2 for $1-2/kg; with the $/kg cost of power at least half of that in the Netherlands scenarios. The evidence of this is shown by the recent unveiling of the world's largest green hydrogen project in Saudi Arabia; 4GW of renewable generation capacity producing 650 tonnes of green hydrogen per day (~240 ktpa), which is expected to be converted to ammonia to facilitate shipping to end-markets. Start-up is expected in 2025. Nearby, we saw in late-July the award of a 2GW solar PV project in Abu Dhabi at a tariff of $13.5/MWh (a world record low)—much lower than the European power prices indicated earlier in this report, and demonstrating the potential for hydrogen production in such regions where renewable power is less costly. However as shown below, electrolyser costs can also contribute: at a 50% capacity factor, reducing electrolyser capex by 66% could reduce unit costs by slightly less than $1/kg.

- **A mixed picture on transport infrastructure.** Further down the value chain, issues on transport and storage were also raised which may counteract some regional production cost advantages. Infrastructure requires further development; however potential solutions here may also serve to use gas networks at risk of becoming stranded, particularly as pipelines were noted as one of the most cost-effective solutions for H_2 transport. Examples of networks in Los Angeles, Italy and Netherlands were given; we also note the recent proposal from German pipeline operators for a 1200km H_2 grid using 1,100km of converted gas pipeline (H_2 Startnetz 2030). We also note a recent industry report published following the EC's Hydrogen Strategy, which envisions the progressive development of a 23,000km hydrogen network across Europe by 2040, connecting key regions in Europe ("Hydrogen Valleys") together—of which 75% would consist of retrofitted natural gas infrastructure.

- **Transport has the most attractive end-uses.** Heavy/medium-duty trucks, long-distance transport (bus/coach) and SUVs are segments where H_2 can not only be more competitive than conventional solutions, but also the most cost-competitive low-carbon solution. It was indicated that the cost of H_2 refuelling stations has fallen 50%, and a further 50% reduction would make H_2 competitive with gasoline. In other areas (e.g. steel, fertilizer) H_2 can be the most competitive low-carbon solution but is less competitive than conventional options. However this can be counteracted by pressure to decarbonise: we reference Thyssenkrupp's 2050 climate-neutral ambition (and 2030 targets), and its recent announcement to work with RWE on a longer-term hydrogen partnership; several peers also have climate policies.

Figure 36: Key end-use segments for Hydrogen



(1) Hydrogen is the only alternative and low-carbon/renewable hydrogen competing with grey (optimal renewable or low-carbon shown.

Source: Hydrogen Council (January 2020)—using input from 80 companies of the Hydrogen Council.

Recent developments

- **More policy support arriving.** With speculation on support from the EU's Recovery Fund (see above), policy may provide significant short-term catalysts, in addition to emerging country-level policies. In particular, grant financing under the EC's JTM is specifically for projects that would not be financed on commercial terms. A potential carbon CfD on CCS projects for Blue H_2 was noted (we also observe that in 2018, all new CCS project announcements in Europe were tied to H_2). California's LCFS was cited as incentivising involvement along value chains, as demand-side progress has in some markets lagged the supply-side. Policy can also support scale growth (green H_2 is currently not GW-scale) to achieve the mentioned cost reductions.

- **Ørsted** has joined a consortium of other Danish transport companies (AP Moller Maersk, DSV Panalpina, Copenhagen Airports, ferry operator DFDS, airline SAS) to produce 250 kt of hydrogen based on offshore wind energy. The first stage (a 10MW electrolyser) is targeted to be operational in 2023, with a second stage (250MW) to develop by 2027 and a final stage (1.3GW) in 2030. Another of Ørsted's hydrogen projects, Westküste 100 (30MW electrolyser, in partnership with several other companies including EDF, ThyssenKrupp and Holcim) recently received funding approval from the German Federal Ministry of Economic Affairs and Energy for €30mn of backing, out of a total investment requirement of €89mn.

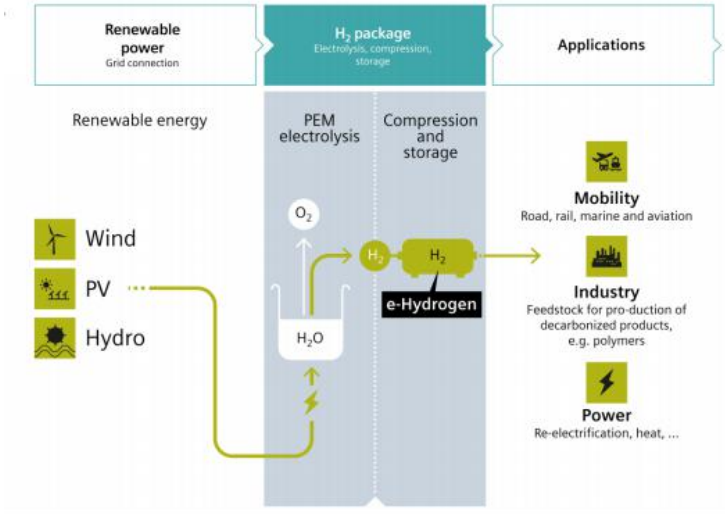
- **Siemens and Engie** also announced a 12MW green hydrogen project in France where renewables from the grid will be mixed with natural gas to power a gas turbine. Engie has also jointed the Multiphy hydrogen project Rotterdam (consortium including Neste and Sunfire). **Wärtsilä** also announced that it is developing technology to allow for 100% hydrogen fuel to be burned in its gas engines (and has previously tested a blend of up to 60% hydrogen with 40% natural gas). **Daimler** and **Volvo** have signed a preliminary non-binding agreement to establish a JV to develop fuel-cell solutions for heavy-duty vehicles.

- **Germany** recently announced its Hydrogen Strategy in June. The proposal emphasized the use of Green Hydrogen produced from renewable power generation, with Blue Hydrogen (Natural Gas + CCS) to be used as part of a transition. As part of their strategy Germany plans to establish up to 5GW of power generation for green hydrogen production by 2030. An additional 5GW is to be added "if possible by 2035 and no later than 2040".
- We note that economic and energy ministries in **Germany** and the **Netherlands** are conducting a joint study into a jointly-developed hydrogen market, to establish a value chain from renewable generation in the North Sea to industrial customers in the border regions between these countries (project HY3). Currently this is a feasibility study, and several aspects are being examined: including transport (e.g. using infrastructure from the Groningen gas field) and storage (e.g. in salt caverns or depleted gas fields).
- Similarly these two countries have also signed an MoU to cooperate on grid and power transmission (which could support the joint development of renewables and also explore mechanisms such as cross-border redispatch). In addition, German gas pipeline operators have presented a plan for a 1 200km hydrogen grid (H_2 Startnetz 2030), of which 1,100km is converted gas pipeline, connected to 31 hydrogen projects.

Beneficiaries of green stimulus

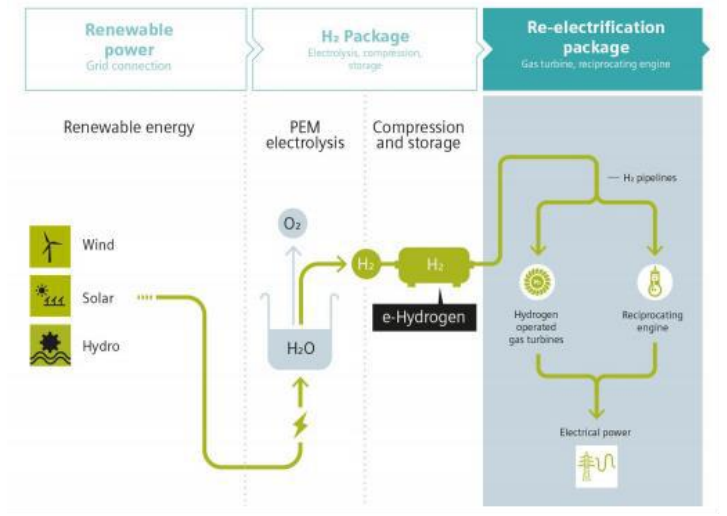
- **Siemens Energy Hydrogen positioning.** Siemens' newly created, and soon to be spun off as a separate entity, Siemens Energy business features a best-in-class efficiency electrolyser offer. Its Silyzer 300 offers c75% efficiency at 2,000 kg/h rate. The solution generates "green" hydrogen from renewable energy using PEM electrolysis that can subsequently be used in direct applications (Mobility, Industry, Power) or for re-electrification. We estimate the hydrogen business within Siemens Energy to be in the range of c€200mn of sales—albeit very small at this stage, we believe it offers option value in this potentially very high growth area. Siemens Energy is planned to be spun off on 28 September, containing Siemens Gamesa Renewables Energy 67% stake and Siemens' Gas & Power assets across Central and Decentralised Power Generation as well as Transmission.

Figure 37: The Siemens' H_2 package and applications



Source: Company data

Figure 38: And re-electrification package



Source: Company data

Figure 39: Key stocks with hydrogen exposure—CS rated

Company	TP	CS TP Upside	CS Rating	MC (US$ bn)	P/E		Sales	Earnings	Quality	Momentum	Business Sustainability	Refinitiv ESG Momentum
					12MF	12MF/5Y median	Consensus '20-22' CAGR		Percentile rank			
Siemens	€145	22.22%	O	119.3	18.0	31%	4%	19%	54	74	56	0.1%
Royal Dutch Shell plc	p1,600	41.7%	O	96.7	14.3	9%	14%	77%	18	49	47	-1.0%
Air Liquide	€145	3.42%	O	78.6	26.3	36%	5%	9%	32	54	49	19.3%
Air Products & Chemicals	US$317	9.53%	O	63.9	29.9	40%	9%	14%	39	68	43	-2.8%
Engie	€14	18.01%	N	33.0	11.8	-6%	5%	25%	15	29	36	19.5%
Endesa	€20	-13.63%	U	29.5	14.6	-5%	0%	0%	12	60	39	10.4%
Snam	€5	9.69%	O	17.7	13.1	-9%	3%	4%	18	56	38	0.9%
Lincoln National	US$41	12.48%	N	7.0	3.8	-46%	3%	18%	51	11	42	5.0%
Canadian Utilities Limited	C$38	11.81%	O	7.0	16.4	0%	0%	8%	21	42	52	2.5%
Italgas	€6	4.04%	N	5.3	12.9	-1%	2%	1%	34	60	45	8.7%
Chart Industries, Inc.	US$72	0.74%	O	2.6	21.3	-24%	5%	16%	70	85	45	45.1%
Bloom Energy	US$24	47.24%	O	2.2	na	na	26%	na	20	95	34	0.0%

Source: Company data, Credit Suisse estimates

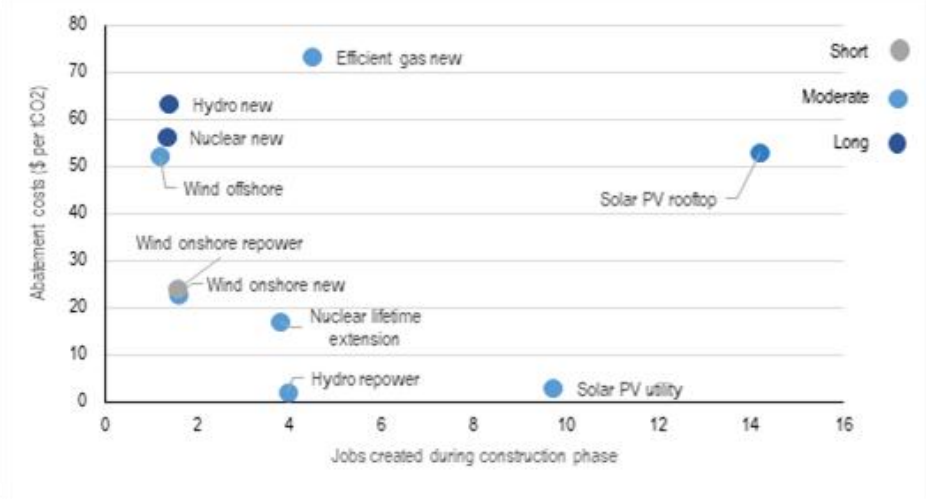
Renewable energy

The impact of COVID-19

The IEA estimates that the COVID-19 crisis temporarily reduced electricity demand by 20% or more in countries with lockdown measures. As a result of lower electricity demand, power sector revenues are set to fall by around 7% globally in 2020 (IEA). The electricity sector represents a major global employer and will have an important role in economic recovery. The sector employed c.17mn people in 2019, with nearly 12 mn in generation, and a further 5 mn jobs related to building, operating and maintaining electricity networks (IMF, IEA). Of these, it is estimated that there are about 5mn jobs associated with the solar and wind industries (IRENA, 2019), accounting for nearly one-third of global power sector employment.

In relative terms, wind and solar have shown strong resilience to the COVID-19 crisis, with estimates suggesting they will be the only source of energy to grow in 2020, albeit with capex to decline by about 15% (IEA, 2020b) due to project delays from 2020 into 2021. Based on our review of the economic multiplier effects of investment in renewables, there is strong evidence (IMF, IEA) that additional solar and wind power stimulus would create a substantial amount of new jobs and cost effectively reduce CO_2 emissions (wind is cheaper than gas with a CO_2 price of €30-50/tn, on our estimates). Our review of global policies shows that policy support is building for this as an effective Green Stimulus response to the pandemic, but with a large amount of funding earmarked for 'decarbonisation' but not yet deployed to specific end-markets, we believe renewables may yet still see a substantial increase in government support.

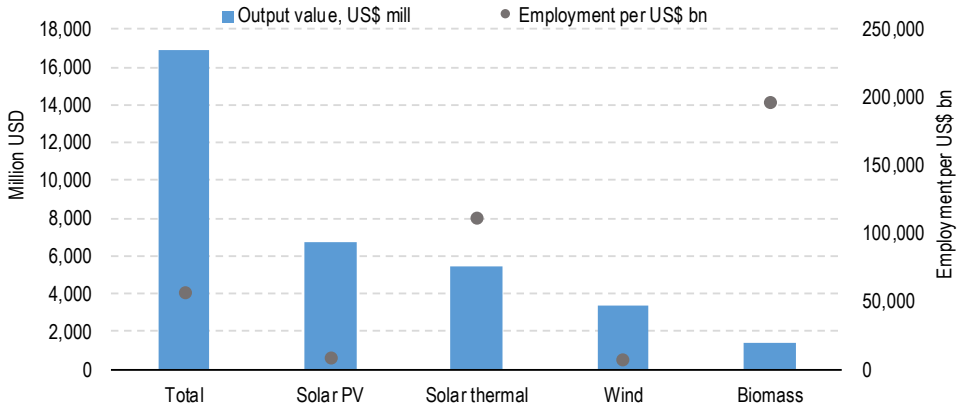
Figure 40: Job creation per US$1mn of capital investment in power generation technologies and average CO2 abatement costs



Source: IEA, IMF, Credit Suisse estimates

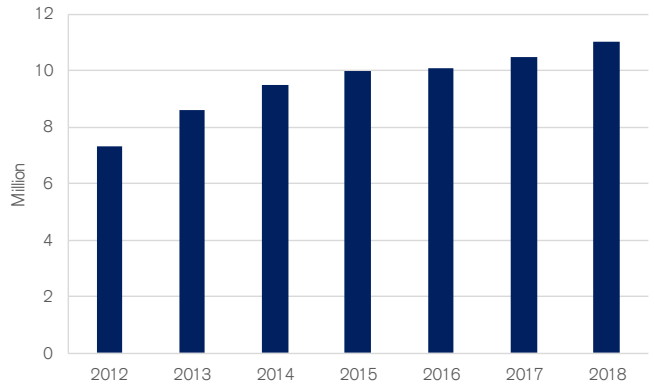
Using IMF and IEA data in Figure 40 we show jobs creation per US$1mn investment for various renewable energy stimulus options for governments against the relative emissions abatement cost. Solar, and particularly utility-scale solar, offered the clearest path towards low cost abatement costs and job creation in the recovery as the most labour-intensive energy technology. For utility-scale solar, US$1mn capex creates three construction jobs and six manufacturing jobs. Rooftop solar is also labour intensive, creating 10 jobs in the construction phase. Onshore wind projects are less labour-intensive than solar, creating one job in the construction phase and 1.5 manufacturing jobs per US$1mn invested. Offshore wind stimulus is titled more to manufacturing, creating twice the number of jobs per unit of investment.

Figure 41: China example—employment and value added in Chinese Renewable Energy production. Employment in numbers of workers, (output in US$ mn)



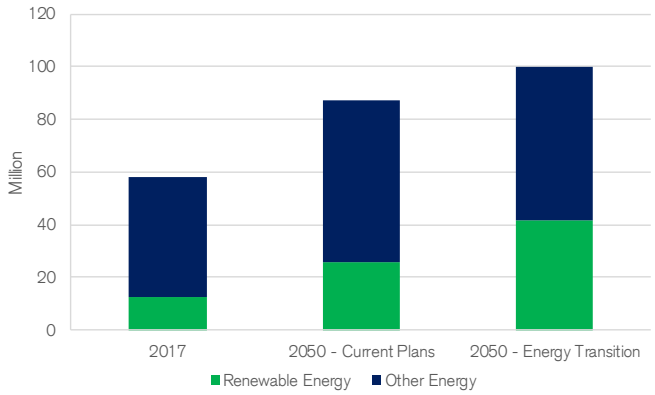
Source: Renner, Sweeney and Kubit, 2008

Figure 42: Total number of jobs in renewable energy globally



Source: IRENA

Figure 43: Potential 2050 split of global energy employment



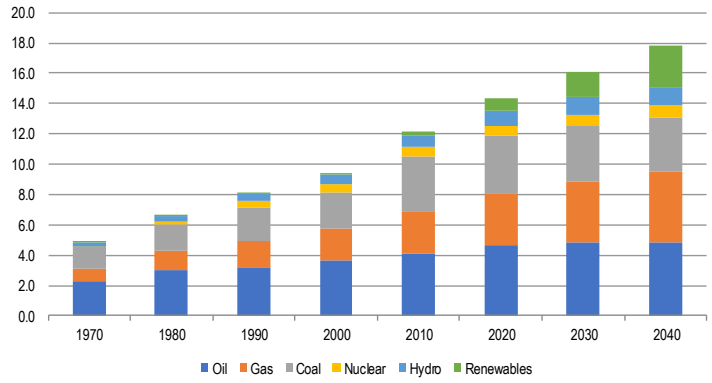
Source: IRENA, Credit Suisse

Thematic drivers

Our analysts across the US, Europe and Asia have a positive view on the growth potential for renewable energy.

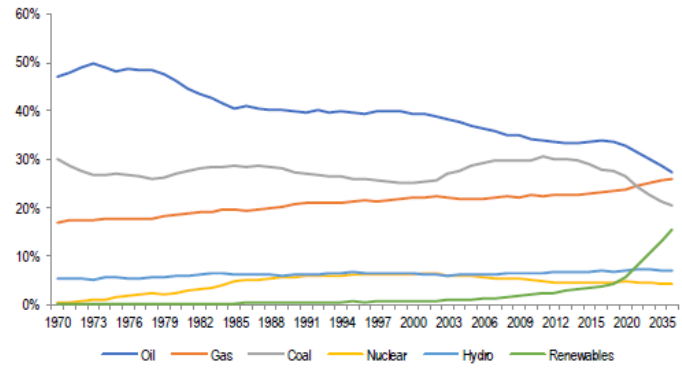
- Wind and solar PV power technologies have rapidly become the most favoured power generation technologies in markets around the world. In 2019, capital spending in wind and solar PV made up almost half of total power plant investment. Wind and solar PV accounted for 80% of the growth in global electricity supply in 2019 and now make up the majority of global power capacity additions, up from under 20% in 2010 (Figure 2.5). The rapid growth of solar PV and wind has been paired with impressive cost reductions: close to 80% on average for solar PV, 40% for onshore wind and 30% for offshore wind power over the past ten years (IRENA, 2020).

Figure 44: Total global energy consumption (billion toe/y)



Source: BP Energy Outlook 2019

Figure 45: Shares of total global primary energy consumption



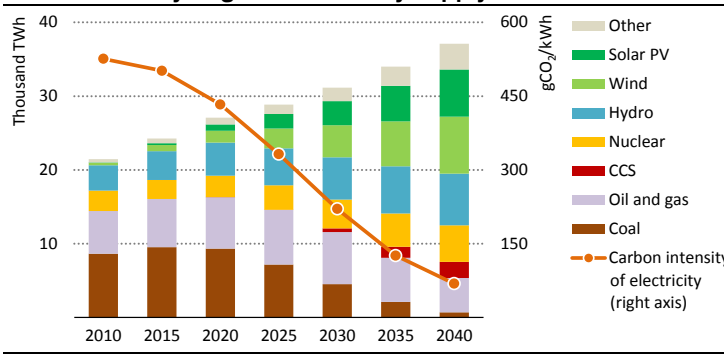
Source: BP Energy Outlook 2019

- Renewables are unlikely to dominate the overall energy mix due to intermittent source of generation and lack of economical energy storage solutions. Today, we note that their significance in relation to electricity generation is greater. Lower costs of renewable energy generation (compared to traditional gas/coal/nuclear sources) and climate change are a key driver behind the likely rise of renewable energy as a source of electricity supply. In the IEA's Sustainable Development Scenario, for example, the share of renewables in electricity generation needs to triple to c66% in 2040. IMF calculations show a similar result, with the share of low carbon electricity supply rising from 40% in 2020 to 80% in 2050.
- In addition to climate change, we see the use of renewables also driven by the need to expand access to electricity to more people globally, especially those in developing

economies. Globally close to 1bn people are still without access to electricity (IEA). Progress on this, however, is being made as, for example, the share of people in Asia that have access to electricity has risen from 67% in 2000 to 91% in 2017. In sub-Saharan Africa, however, access to electricity is still only 43%. Solar and wind energy sources coupled with energy storage technologies (e.g. batteries) help in achieving universal energy access.

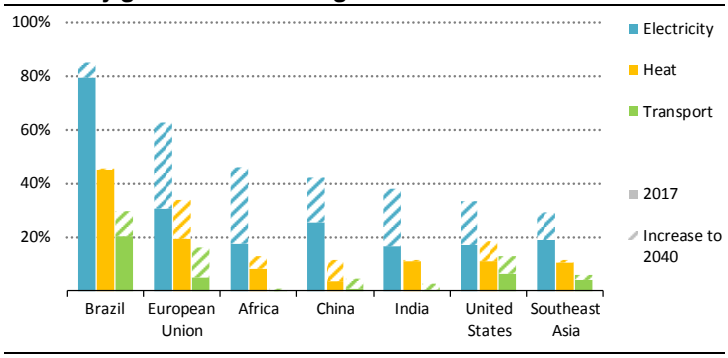
- Estimates from the IEA suggest that annual investments in wind and solar globally will reach US$218bn and US$186bn by 2040, respectively, bringing total cumulative investments in renewable-based power generation to US$12.8tn over the 2018-40 period. Of this, wind is expected to account for 34%, followed by solar at 33% and hydropower at 18%. China, the European Union, the United States and India account for over 60% of investments.

Figure 46: Renewable share to increase in order to reduce carbon intensity of global electricity supply



Source: Company data, Credit Suisse estimates

Figure 47: The share of renewable energy is set to rise most in electricity generation in all regions

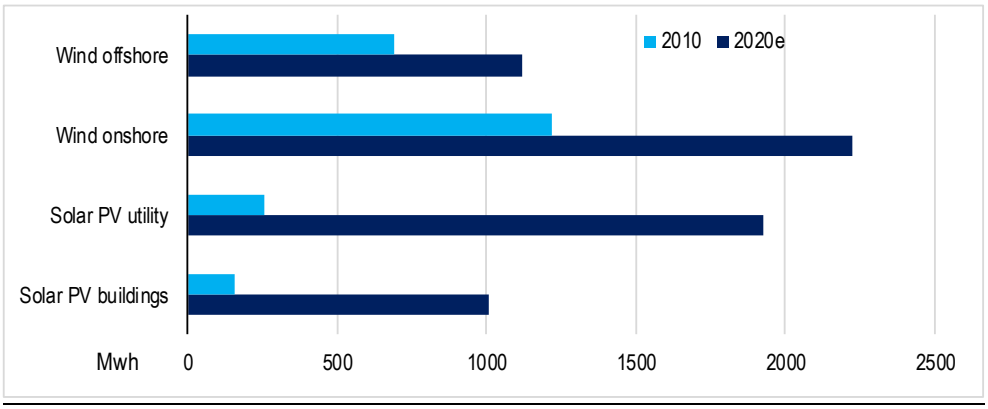


Source: Company data, Credit Suisse estimates

Solar PV and wind deployment are increasingly competitive, but their deployment remains closely tied to supportive policy frameworks for renewable energy in close to 180 countries. Direct financial support for solar PV and wind is now less common than in the past, though it is still used to accelerate investment. In the United States, investment and production tax credits continue to support solar PV and wind expansion.

Falling costs for new solar PV and wind projects over the past decade have made capital investment far more productive. The expected annual generation from investment in solar PV in 2020 is more than seven-times the amount for the same investment in 2010: for onshore wind it has nearly doubled and for offshore wind it has risen by over 60% (Figure 48).

Figure 48: Green stimulus in renewables is now a safer bet vs GFC: annual electricity generation per $1mn of capex in solar PV and wind power, 2010 vs 2020e



Source: IEA, IRENA, 2020

Solar PV and wind power offer opportunities to deploy capital rapidly at both new and existing sites. New projects can be constructed quickly once permits are in place. The streamlining of administrative processes would help to speed up projects further. For projects that have chosen

sites and obtained the necessary licences, the construction phase can often be completed in less than a year. Rooftop solar PV installation draws on widely available skills and can also be scaled up quickly.

Projects to repower existing sites can generally deploy capital even more quickly because they do not have to manage pre-development or site preparation and there are fewer permitting processes. There are significant opportunities to repower ageing wind farms by upgrading turbines and other components: over the past three years, about $13bn was invested to repower wind parks in the United States and Europe, and there is potential for nearly twice that amount to be invested in the next three years (IEA, 2020d). Opportunities are more limited for repowering solar PV as the vast majority of existing capacity has been built within the past decade. Repowering wind and solar projects are as cost effective as new projects in reducing power sector emissions.

Recent developments

- **In offshore wind**, we saw **Siemens Gamesa** unveil the SG 14-222 DD turbine, which can provide 15MW of capacity using power boost (nominally 14MW). This turbine will be available in 2024 with prototypes in 2021. This challenges the GE Haliade-X turbine (12-14MW) and has already seen orders placed, including for the 2.6GW Dominion Energy CVOW project. This was closely followed by an announcement from German turbine blade manufacturer Aerodyn, unveiling new blades compatible with 11-15MW sized turbines.
- **On policy**, we note that **Germany** has now passed into law the targets to develop 20GW offshore wind by 2030 and 40GW by 2040. In **Spain**, a draft 'Climate Change and Energy Transition Bill' was approved by the cabinet and now is seeking approval in Parliament. This bill has several measures, including for example: the immediate ban on new coal, oil and gas extraction projects; ending direct fossil fuel subsidies; making all new vehicles emissions free by 2040; setting annual bio/alternative fuel targets for air transport; and to generate 100% of electricity with renewables by 2050. In the **UK**, proposals for the country's own ETS; this is planned to set a cap on emissions 5% lower than the UK's notional share of the EU ETS cap.
- **Countries' renewables tenders:** The French Government confirmed that it will tender 8GW of offshore wind this decade (previously from 5GW). The New York Public Service Commission also cleared the tender for 1.0-2.5GW of capacity at its next offshore wind auction.
- **China:** On 17 June, the Ministry of Finance announced its renewables tariff subsidies budget for 2020 at Rmb92bn, which implied 7.5% YoY increase. According to local news (China5e) in July, QIN Haiyan, the Secretary of China Wind Energy Association, proposed that the central government should consider issuing Rmb300bn green bonds to solve the renewables subsidy payment delay issue. We believe the possible subsidy collection improvement would help further boost the development of renewables in China.
- **Philippines:** On 5 June, the Philippines' Congress Committee on Climate Change approved House Resolution 761 calling for a climate emergency response, which includes not permitting any new coal plants. Such a measure would support the Department of Energy's earlier caution against an overreliance on inflexible technologies such as coal that cause grid instability. Just last month, AC Energy announced it would finalise coal exit plans by 2025 with full divestment to be completed by 2030.

Beneficiaries of green stimulus

Figure 49: Key global outperform rated Renewables stock under CS coverage with exposure to Green Stimulus

Company	TP	CS TP Upside	CS Rating	MC (US$ bn)	P/E		Sales	Earnings	Quality	Momentum	Business Sustainability	Refinitiv ESG Momentum
					12MF	12MF/5Y median	Consensus '20-22' CAGR		Percentile rank			
Enel	€8	-0.1%	O	93.9	14.8	21%	3%	7%	14	59	48	0.0%
Duke Energy	US$88	8.84%	O	59.5	15.6	-9%	3%	4%	13	44	39	0.0%
Eaton Corporation	US$102	-0.80%	O	41.1	22.5	55%	4%	20%	71	81	54	-0.5%
Murata Manufacturing	¥7,600	18.75%	O	38.5	22.0	28%	8%	21%	39	54	51	3.7%
BYD Co Ltd	Rmb80	-1.53%	O	30.0	72.5	128%	14%	26%	32	78	43	0.0%
RWE	€30	-9.61%	O	28.1	17.4	37%	2%	9%	15	67	26	-1.8%
Parker Hannifin Corporation	US$228	8.81%	O	26.9	18.7	13%	4%	12%	72	88	54	5.1%
EDP	€5	3.64%	O	18.8	19.0	47%	3%	9%	11	57	35	0.7%
Siemens Gamesa	€17	-27.98%	O	18.5	45.2	170%	7%	na	75	52	54	-9.2%
Tongwei	Rmb32	36.40%	O	14.6	21.8	40%	23%	26%	51	90	38	119.2%
Xinyi Solar Holdings	HK$11	13.42%	O	10.1	19.5	99%	27%	25%	66	87	39	0.0%
Pinnacle West Capital Corp.	US$88	18.17%	O	8.4	15.1	-16%	5%	4%	12	47	35	2.3%
Canadian Utilities Limited	C$38	11.81%	O	7.0	16.4	0%	0%	8%	21	42	52	2.5%
Xinjiang Goldwind Science & Technology Co., Ltd.	HK$9	25.00%	O	6.4	7.0	-16%	-1%	7%	35	41	26	3.1%
Johnson Matthey	p3,100	30.80%	O	6.0	14.4	5%	4%	16%	54	24	54	19.1%
Longyuan Power	HK$7	30.78%	O	5.2	7.0	-17%	6%	11%	26	66	43	2.1%
Wacker Chemie	€90	8.12%	O	5.1	28.6	46%	5%	77%	11	74	47	7.0%
NextEra Energy Partners	US$60	-2.06%	O	4.0	na	na	20%	na	na	na	50	na
Capital Power Corporation	C$32	8.84%	O	2.3	17.0	-1%	-1%	29%	43	39	45	1.2%
SunPower	US$13	-2.07%	O	2.3	na	na	18%	na	21	40	33	-10.1%
Sunnova Energy International	US$26	3.83%	O	2.2	na	na	34%	na	5	36	20	na
Bloom Energy	US$24	47.24%	O	2.2	na	na	26%	na	20	95	34	0.0%
Landis + Gyr	SFr88	48.65%	O	1.9	17.3	16%	-1%	9%	54	36	59	0.0%
Daqo New Energy	US$145	8.72%	O	1.9	8.3	44%	11%	26%	38	97	40	na
TransAlta Corporation	C$12	35.14%	O	1.8	na	na	1%	na	11	61	46	-13.4%
First Gen Corporation	P27	13.92%	O	1.8	7.4	-1%	9%	11%	43	44	59	na
Drax	p05	9.79%	O	1.4	9.7	-59%	2%	11%	30	51	46	6.2%
Omega Geracao	R$40	-0.35%	O	1.2	45.7	102%	10%	104%	42	34	48	na
Azure Power Global Limited	US$23	4.07%	O	1.1	na	na	30%	na	34	46	40	0.0%
GCL New Energy Holdings	HK$0.11	30.72%	O	0.4	6.5	8%	-2%	0%	51	35	49	na

Source: Company data, Credit Suisse estimates

Chemicals

The impact of COVID-19

Across the European Chemicals Space, COVID-19 has already inflicted significant disruption to end market demand, supply chains, working capital management, and financial leverage/risk. We anticipate a range of longer-term impacts across company operations, financial structure and strategic direction.

- **Operationally**, we consider three specific impacts: (1) focus on localised supply chains—as demand becomes more localised, with potential for this to be further bolstered by carbon border tariffs. This would imply greater differentiation between regional pricing spreads (where markets were currently considered at the global level). This has broad based implications for the sector, supporting high-cost but lower-carbon producers in regions where imports are a threat in the long-run; (2) shoring up the food supply chain—as food security/agricultural efficiency becomes a greater priority for each region/country, benefitting Ag input producers from an opportunity to sell greater volumes of products; and (3) reduced out of home consumption, increased home-based expenditure. This provides a demand tailwind for Coatings and food flavours (namely Savoury).
- **Financially**, we consider three specific impacts: (1) greater focus/reduction of financial leverage targets. On average the sector has targeted 1-2x ND/EBITDA through the cycle. The extent of recent COVID-19 earnings downside has escalated many of these to above 3x (albeit arguably at trough cycle conditions); (2) lean working capital balances have highlighted when pressure is placed on supply chains—back up stocks soon run dry. This may lead to greater working capital buffers/safety stocks throughout some specialty chemical exposures supporting demand but perhaps creating volatility; and (3) private equity's role in chemicals on pause? The increasing cost of non-investment grade debt is likely to impact private equity's role as an acquirer of commodity chemical assets. This is likely to slow some European Chemicals 'Specialty Chemicals' transformation stories as they seek to divest exposures that have become increasingly commoditised.
- **Strategically**, we consider three specific impacts: (1) M&A focus reduced—as more stringent balance sheet focus limits financial headroom. Commodity chemical valuations (typically funding agents) are below mid cycle on trough cycle earnings; (2) value of innovation projects to come under increased scrutiny (in many cases underpinned by energy efficiency and/or renewable feedstock) in a US ~$40/bbl oil price environment, in some cases leading to impairments (e.g. Solvay - Cytec and DSM - POET); and (3) flattening the global cost curve: European Petrochemicals has long been a high cost oil based producer with high (gas based) energy costs. Sustained lower feedstock costs (relative to other regions) combined with limited recent European capacity increases suggests any demand recovery could support short term European commodity chemicals profitability.
- **Left Field impacts**: We consider some 'left field impacts' which whilst they don't form our base investment case could form a longer term disruption across the European Chemical sector. These include: (1) Sustainability of green inputs and customer's willingness to pay an elevated premium (considering synthetic price declines) balanced against policy incentives; (2) potential product demand tailwinds (medical equipment, protective screens, pet food from greater adoption); and (3) spending more time at home (both socially and work)—a longer term headwind on high end personal care and fine fragrance, but a tailwind on food flavours. Lower miles driven suggests longer replacement cycles (negative for automotive generally but specifically tyre demand and refinish).

Figure 50: Mapping COVID disruption across chemicals

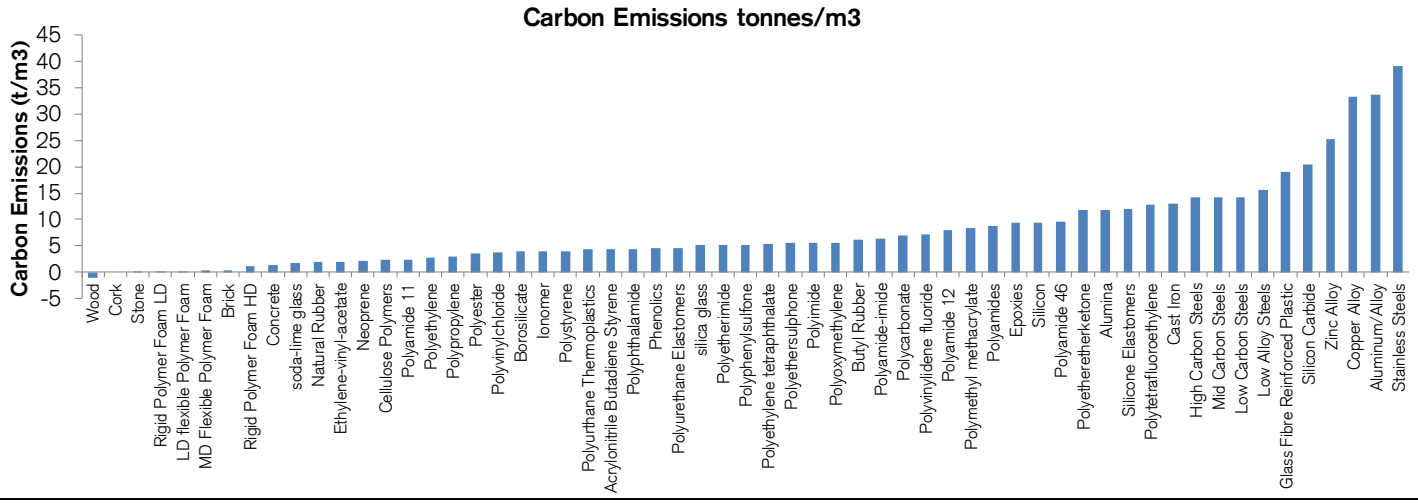
Impacting	Theme	Impact	Result	Stock Implications: Positive	Stock Implications: Negative	Sector Net Demand Implications
Operations	Focus on Localized Supply Chains	More local/regional commodity markets	Greater potential for regional price/spread dispersions across chemicals		BASF, 1COV - Expect volatility	Neutral
		Increased focus on shoring up the local food supply chain	Food security becomes a greater priority for each region a volume opportunity for regionally and crop diversified Crop and Animal input producers.	BASF, DSM, NZY, EVK		Positive
	Reduced out of home consumption – increasing home based expenditure	Greater DIY expenditure	We anticipate a short-term increase in DIY offsetting trade volumes. Longer term likely to increase DIY painting across Europe – further highlighting the importance of brand quality, retail presence and distribution	AKZO		Neutral
		Eating at Home	Net tailwind for food flavours given in-home consumption versus out-of-home	GIVN, SY1G, NZY		Positive
		Personal Care Implications	Base personal care formulations: Minimal demand impact through COVID-19, would not expect a structural medium term change in demand; Fine-Fragrances and Cosmetic Ingredients: impacted as a function of sustained lower air traffic (key sales channel – in addition to a greater proportion		CRDA (Margin Dilutive), GIVN, SY1G	Negative
		Lower Miles Driven	Negative implications for the primary automotive market as well as fuels (inc. biofuel), parts (e.g. tyres) Offset as consumers look to commute by private over public transport		EVK, SOLB, SYTS, NZY, JMAT, UMI	Negative
Financial Considerations	A more conservative approach to financial leverage	Increasing focus on balance sheet/liquidity measures is likely to increase management's focus on reducing financial leverage through the cycle		VCT, FPEG, NZY	SDF, SOLB, ELM	Negative
	Ability to flex working capital for FCF generation	Intensified focus on supply chains, the lack of surplus inventory/raw materials in the channel, and interdependency of supply chains across multiple regions				Negative
	A decreased capex focus	European Chemicals are still overweight (historically low growth) European end markets. Strategically, diversifying away to other regions has been a long held target and we expect this to continue				Neutral
	PE's role in Chemicals on Pause	Commodity chemical spreads/demand (into cyclical end markets) has been significantly impacted by the current demand downturn. This has significantly impacted earnings of these businesses and Non investment grade credit spreads have increased significantly. This is likely to impact PE's ability to finance any transactions.			SOLB, AKE	Negative (delays/inhibits portfolio change)
Other	Sustained lower oil price	Lower naphtha pricing relative to gas ...dstock benefits European production margins	US producer cost advantage has roughly halved since 2018 vs European and Asian producers (Asian feedstocks have largely fallen in line with Europe).	BASF		Positive (Europe)
	Sustained increase in the use of protective plastic (Plexiglass) screens	...chains/restaurants considering the adoption of protective plastic between employees and customers. PMMA is the most likely solution.		AKE (beginning sale process)		Positive
	Securing the food supply chain/personal health	An increasing focus on securing the food supply chain to drive higher animal nutrition volumes		DSM, NZY, EVK		Positive
		Improved uptake of human nutritional enhancement products - uptick noted through COVID-19, anticipate a higher level of vitamin use subsequently		DSM, BASF		Positive
	A shift to greener based inputs/solutions - At risk from lower oil raws Consumer attitudes + green stimulus could offset	...l prices a minor factor to cost considerations - stimulus/improved air quality could provide demand support for electric vehicles		BASF, UMI, JMAT		Positive
		Lower oil prices raise the relative cost of green chemistries putting these projects at risk ...stomer attitudes towards health/healthy lifestyle may dictate they are willing to pay a premium for products with green based inputs		CRDA, SY1G, NVY	BASF, AKE, EVK, LXS	Neutral
		Increased medical equipment demand - Synthomer leading producer of Nitrile Latex for gloves		SYTS, CRDA		Positive
	ESG as an investor	Increasing focus on ESG metrics as investment criteria (and fund flows into ESG related funds) should see increased scrutiny with regards to how companies score on these metrics		Mixed results across Companies Supportive for defensives vs cyclicals		Neutral
	Innovation to accelerate, but some themes to lose out	Biofuel/2G ethanol:	Significant oil price decline has resulted in a material reduction in ethanol crush spreads/profitability meaning 2G investments are unlikely to materialise		NZY, CLN, DSM	Negative
		Lightweighting	The current economic uncertainty/low oil price environment may reduce the rate of demand for these energy efficient solutions		SOLB, VCTX, BASF, AKE	Negative
		Oil and Gas Chemistry	The significant decline in energy prices is likely to negatively impact customers' demand for these innovations/capital investment in new production/projects. This is likely to inhibit demand for the catalyst players product longer term		CLN, JMAT, EVKN, BASF	Negative
	Growing pet demand	Pet Food	High demand on pantryloading. Adoption rates restrained by lockdowns, but demand for adoptions appears high. Greater time at home strengthening pet-owner bond, driving higher spend per animal.	SY1		Positive

Source: Credit Suisse analysis

Thematic drivers

- **Materials sectors have a significant role to play in the energy transition.** Material supply chain producer's energy can represent ~30% of product sales. Policy has focused on decarbonising electricity generation and transport; little policy directly addresses industrial consumption so far. ~75% of energy consumed in manufacturing materials is derived from fossil fuels, coal accounting for ~50% (steel and cement) and natural gas the majority of the remainder. As demonstrated below, wood, glass and plastics require substantially less energy and can use cleaner energy sources.

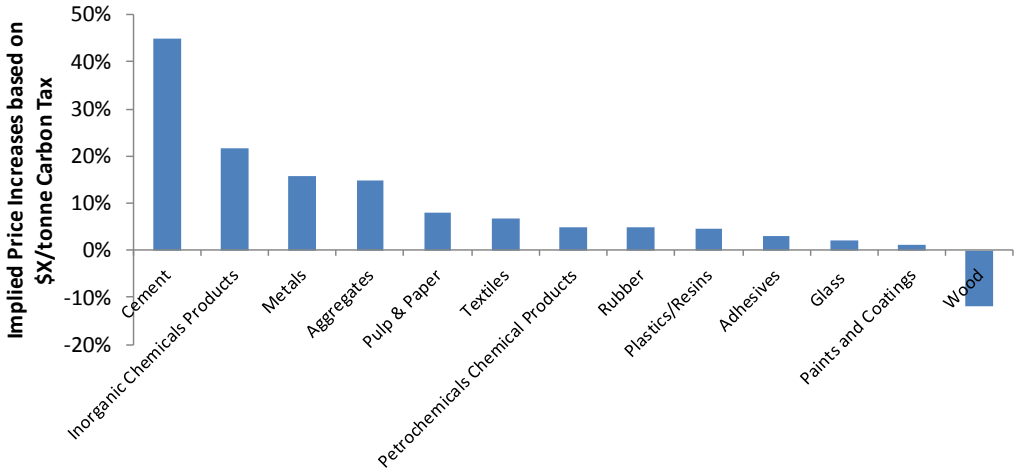
Figure 51: CO_2 emissions t/m3



Source: polmerdatabase.com, Cambridge Materials Data Book, company data, American Chemistry Council, Credit Suisse

- **Are harder to decarbonise without multilateral agreement.** The greatest challenge that exists to transition to low-carbon materials is pricing externalities in an environment where products are commoditised and markets globalised. While the pandemic has led to weaker demand and lower energy prices, the policy response (led by Europe and Korea) has primarily been driven by a green agenda. As part of the Green Deal, the European Commission is currently going through a period of consultation ahead of a Directive for a Carbon Border Adjustment whereby sectors currently importing to Europe would need to pay an equivalent carbon tariff as domestic producers to reduce carbon leakage. Indeed, this may even lead Europe to successfully export carbon tariffs given its importance as an export market. With other producers required to sell to Europe, producers would need to reduce carbon in-line with domestic producers in order to remain competitive.

Figure 52: Price impact from carbon tax on energy sources



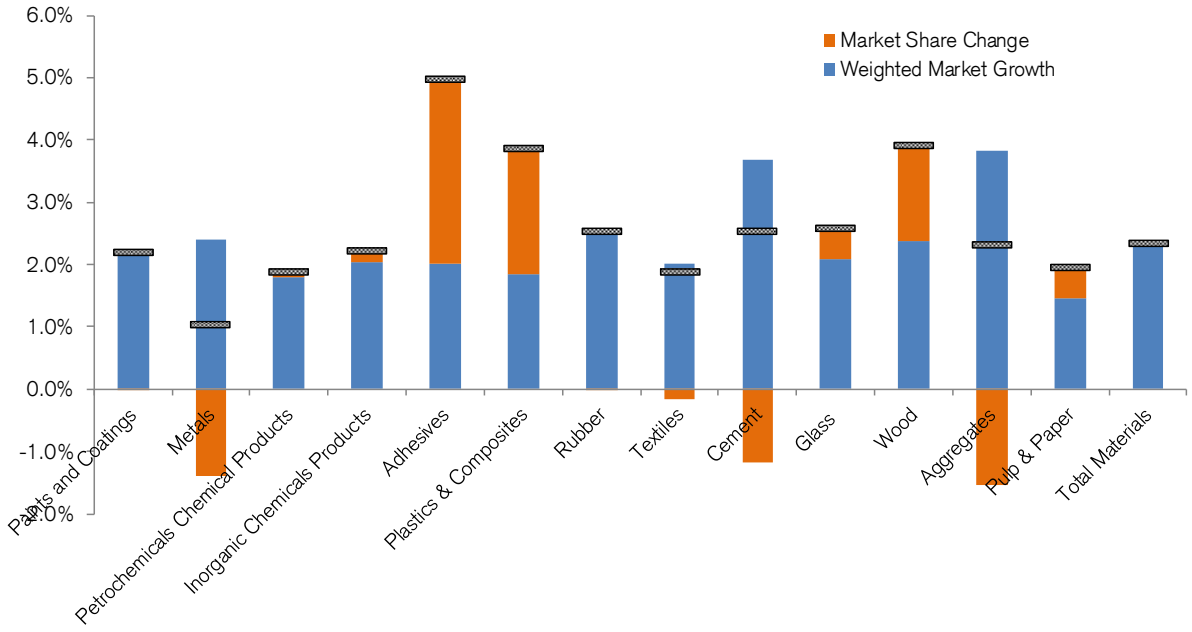
Source: IETD, Grantham Institute, Aluminum.org, Carbon Trust, American Chemistry Society, Industrial Application of Renewable Plastics, An introduction to Industrial Chemistry, Wrap.org, Energy by Vacil Smil, IPCC, IEA, Focus Economics, Credit Suisse estimates

- There exist significant challenges with the implementation of such a proposal—computational challenges with respect to imported products, geopolitical/WTO challenges around border taxes including tit-for-tat taxes on exporters and complexities around intermediate parts. Ultimately, to increase carbon taxes on the most carbon intensive material sectors (primarily cement and steel), which benefit from exemptions ("free allowances"), a border adjustment mechanism is necessary to avoid carbon leakage with

other countries importing materials. A border adjustment, thus, could well pave the way for more significant changes in materials transition, making lower carbon materials more attractive.

- **Automation acceleration and sustainability concerns will drive a revolution in materials.** We expect COVID to accelerate the adoption of automation and digitisation. We expect automation (+ sustainability/consumer trends) to drive share gains in engineering plastics, composites and adhesives vs. metals. We estimate the market value share of plastics will grow from ~14% currently towards 25% by 2050, with mid to high single-digit growth in engineering plastics, GDP-plus growth in basic structural plastics and 2-3% declines in plastic packaging. Advanced materials demonstrated flexibility through the crisi—off-site construction (CLT) enabling social distancing and faster construction, while 3D printing during disruption has met PPE shortages. Overall, increased automation supports mid-term demand for engineering plastics, resins and adhesives producers—we see greatest upside potential for **Arkema**

Figure 53: Across materials—we anticipate an acceleration of demand across adhesives, composites and wood



Source: Credit Suisse Integrated Manufacturing Model, Credit Suisse estimates

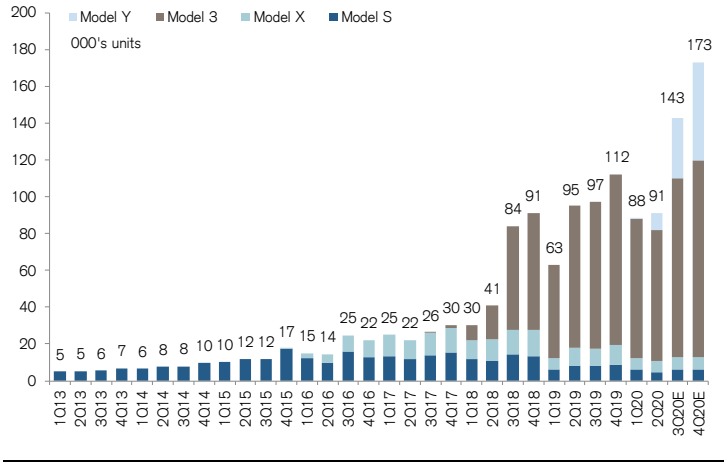
Beneficiaries of green stimulus

- **Renovation wave: key long term winner, Covestro.** We believe Covestro will be a primary beneficiary within our coverage given polyurethane (MDI—represents c25% of revenues) is a commonly used insulation material (in competition with fiberglass, mineral wool, cellulose, polystyrene). BASF should also benefit to a lesser extent. Wacker should see a small benefit from higher Polysilicon demand.

- **Renewables: key long term winner, Air Liquide.** The focus of the Renewables pillar is on developing blue and green hydrogen technologies and associated infrastructure (though we note some stimulus for renewables in general) enabled through the Clean Hydrogen Strategy and Alliance. This is given hydrogen remains relatively nascent in comparison to other renewable technologies and electrified transport. From our coverage, key beneficiaries could be Air Liquide, a key producer of hydrogen today (including a number of CCS/Blue Hydrogen projects). Hydrogen replacing fossil fuels as a store of energy is supportive for their role in supplying the energy transition. Umicore and Johnson Matthey are both producers of catalysts for hydrogen fuel cells and thus also stand to benefit.

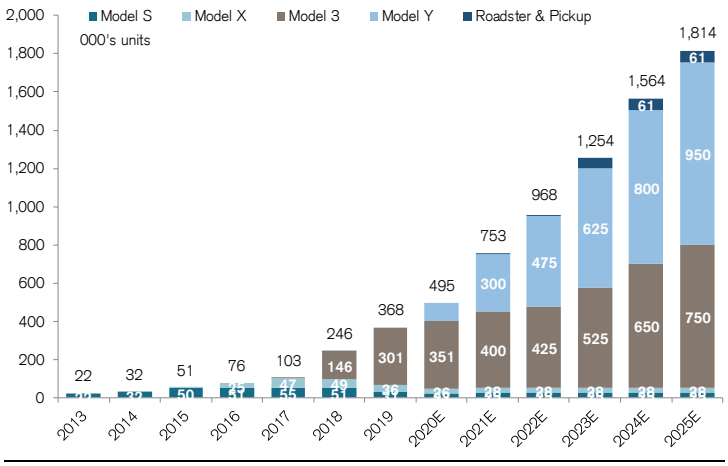
- **Clean mobility: key long term winner, Umicore.** The final pillar of the policy is mobility with clean passenger transport at its centre. Notably, the policy doesn't appear to specifically direct central funding towards subsidies, though following Germany and France detailing EV and clean ICE subsidies in the past week, it is likely to be included in general recovery funding. The primary policy measure is additional funding for one million charge points. We note that stimulus will support demand for the broader sector, and most clearly EVs. This would be positive for Umicore, deriving 40% of sales from EVs (another 40% ICEs), as well as BASF (EVs/ICE: 22% sales) and JMAT (ICE: 60% sales).
- **Clean mobility: key winner, LG Chem.** Following policy tailwinds from major European countries (i.e. Germany and France), EV penetration in Europe is likely to accelerate. As such, key upcoming new EV demand seems quite strong (i.e. I.D 3), resulting in higher utilisation rate for EV battery makers. Currently LG Chem is a main supplier for such new vehicles, with a newly completed Polish factory (60GW out of its total 100GW capacity vs. global EV battery capacity of approx.500GW). As 80% of LG Chem's NAV comes from the battery business, we view the company as a key beneficiary of the clean mobility trend. Thanks to such tailwinds, LG Chem posted turnaround in EV battery business in 2Q20. It is also a key supplier to Tesla and its factory in China, which is seeing rising demand as a result of the popularity of the Model 3 sedans in China.

Figure 54: Tesla quarterly deliveries show strong growth exposure for LG Chem to the Model 3



Source: Company data, Credit Suisse estimates

Figure 55: Tesla annual deliveries



Source: Company data, Credit Suisse estimates

- **Green H_2 for Mobility: multiple potential winners, focus on APD.** APD is the world's largest H_2 producer and is investing ~US$3.7bn in green H_2 for mobility, with green NH3 production based in Neom, Saudi Arabia (focus on H_2 buses/trucks). Roughly ~US$2bn of APD's total investment will facilitate the development of self-powering H_2 fuelling stations (likely in Europe). We expect additional expansion announcements in the coming years.
- **Auto Electrification/EVs—Livent.** Key battery grade LiOH producers should benefit from rising demand of NCA and NMC battery materials as Euro EV producers ramp to accelerate their efforts vs. TSLA. We continue to expect the greater Li industry (as a whole) to remain under pressure due to lacklustre near-term demand and elevated converter inventory levels, but in the long run producers such as LTHM should benefit from accelerating demand.
- **Agriculture: key winner, no one.** Overall biodiversity measures read negatively for Ag names, reducing agchem application by 50% by 2030 is negative for Nufarm, Bayer (covered by pharma team) and BASF (as well as suppliers; e.g. Croda). An offset comes from pricing/innovative products that do more with less. A commitment to reduce fertiliser application by 20% to 2030 implies weaker demand for Yara, K+S and OCI, and given commodity products, less able to innovate.

- **Euro Agriculture: expect industry to react.** While we do not believe application reduction targets are achievable without significantly reducing yield prospects, we do expect the industry to react over time by dedicating greater R&D budgets to "natural solutions" such as biologicals (evidenced by FMC Corporation's relationship w/ Chr. Hansen, among others). Additionally, expect key CPC producers to invest further in products with lower toxicity levels, improving biodegradability and residue reduction (among a host of other factors). In the long run, we expect greater share gains for tier 1 (and potentially tier 2) CPC producers (FMC, Corteva Inc. (CTVA), etc.) vs. generics and off-patent focused CPC platforms.
- **Consumer focus on natural ingredients: key US winner, ASH.** Greater consumer focus on naturally sourced products, improving biodegradability and a shift toward bioactives /biofunctional ingredient preferences should further improve demand for ASH's personal care ingredients, especially in skin.
- **Orbia as potential beneficiary in building renovations and agriculture.** Our LatAm team has also highlighted Orbia, a Mexico-listed global conglomerate given Europe is its main market with 37% of consolidated revenue. Through its subsidiaries Wavin (33% of revenue) and Netafim (16% of revenue) the company aims on drainage plastic pipes & applications, as well as high-tech solutions for micro-irrigation. Orbia stands to benefit both from lower fertiliser application (driving further demand for micro-drip) and from incremental renovations, as these could entail substitution of old drainage applications. The company contributes to global sustainable development through its commitment to "advance life around the world" aimed at addressing global challenges such as resource scarcity (especially water), rapid urbanisation, and health & well-being. Amongst its specific sustainability goals, we highlight achieving net zero emissions by 2050 as its main milestone to achieve.

Figure 56: European green deal overview—likely key winners and losers

	Scheme details	Winners	Losers
Renovation Wave	Insulation	Covestro, BASF	
	Rooftop-solar PV	Wacker	
	Efficient/renewable heating/cooling systems	Arkema	
Renewables	Renewable and energy storage technologies	Wacker	
	Clean Hydrogen Strategy and Alliance	Air Liquide, UMI/JMAT	
Cleaner transport	1 million charging points	Umicore, BASF	
	Boost for rail travel		Solvay (aersopace)
	Clean mobility in cities - cycling		Auto - JMAT, UMI, BASF
Circular Economy	Circular Economy Action Plan	Metals/batteries - Umicore, JMAT, BASF	
Biodiversity Strategy	Crop Protection reduce by 50% by 2030		BASF, Bayer (Pharma team)
	Fertilizer use reduce by 20% by 2030		Yara, K+S, OCI
	Digitalizing Agriculture	BASF, Bayer (Pharma team)	
	Biofuel production	Novozymes	

Source: Company data, Credit Suisse estimates

Figure 57: Key global CS-rated chemical exposures to Green Stimulus

Company	TP	CS TP Upside	CS Rating	MC (US$ bn)	PE		Sales	Earnings	Quality	Momentum	Business Sustainability	Refinitiv ESG Momentum
					12mF	12mF/5yr median	Consensus '20-22' CAGR		Percentile rank			
Air Liquide	€145	3.4%	O	78.6	26.3	36%	5%	9%	32	54	49	19.3%
BASF	€50	-3.44%	N	56.2	18.5	30%	5%	47%	30	22	41	0.2%
LG Chem Ltd.	W810,000	13.60%	O	44.9	37.1	177%	18%	35%	32	90	48	0.4%
Novozymes	Dkr320	-12.02%	U	16.6	33.2	20%	4%	9%	55	47	56	1.3%
Umicore	€ 8	-27.05%	U	11.4	27.4	18%	14%	20%	26	79	50	13.5%
Solvay	€76	4.37%	N	9.1	12.0	-1%	5%	12%	28	33	59	6.2%
Covestro	€37	-8.82%	O	8.8	38.4	226%	8%	747%	32	51	46	3.9%
Arkema	€95	1.41%	O	8.5	15.4	24%	5%	22%	31	50	52	1.4%
CF Industries Holding Inc.	US$40	19.65%	O	7.2	20.8	15%	5%	17%	45	47	38	18.8%
Johnson Matthey	p3,100	30.80%	O	6.0	14.4	5%	4%	16%	54	24	54	19.1%
Wacker Chemie	€90	8.12%	O	5.1	28.6	46%	5%	77%	11	74	47	7.0%
Ashland Global Holdings Inc.	US$91	19.89%	O	4.6	23.8	17%	5%	19%	33	70	48	5.9%
Orbia Advance Corp	MXN57	55.53%	O	3.5	14.3	2%	7%	37%	47	33	52	21.1%

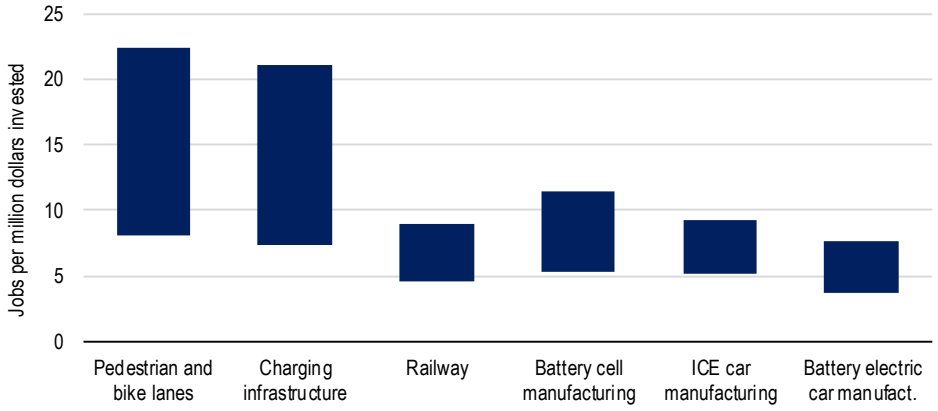
Source: Company data, Credit Suisse estimates

Transport and Infrastructure

The impact of COVID-19

As expected, global car transport has been significantly impacted by COVID-19, down c. 40% in April 2020 vs. previous months (IEA). This has, in turn, impacted car sales, which have seen a 30% YoY drop in sales 1Q 2020. As an employer of c. 11mn workers globally, Green Stimulus within the auto sector would have a meaningful effect on employment. At present, it is estimated that around 2mn jobs in the industry are at risk globally, representing around 15% of the manufacturing workforce in this sector (IEA).

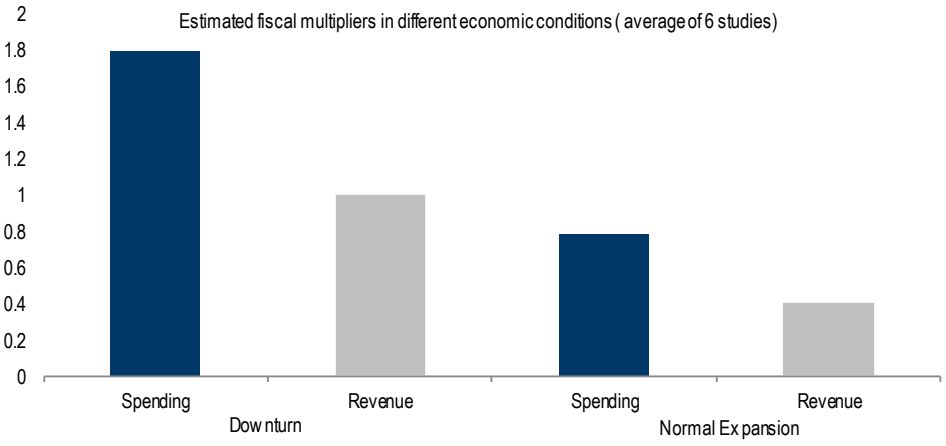
Figure 58: Employment multipliers for investment in the transport sector



Source: IEA, IMF

As expected, the aviation, rail and public transport sectors also have been hit hard by COVID-19, with air travel expected to be c. 50% lower in 2020 vs pcp (Peace, 2020). Many governments are now looking to support the transport sector to preserve employment and ensure continuity of services, but many are doing so in a way that ties support to decarbonisation targets. Transport infrastructure is a natural place to focus recovery efforts. According to the IMF, for every 1% of GDP invested in infrastructure, economic output increases by about 0.4% in the same year and by 1.5% four years later. The G20 has already announced an injection of $5tn into the global economy, and sustainable infrastructure aligns with climate mitigation.

Figure 59: The multiplier for fiscal spending in infrastructure is greater than it is for tax cuts, and more so in a downturn



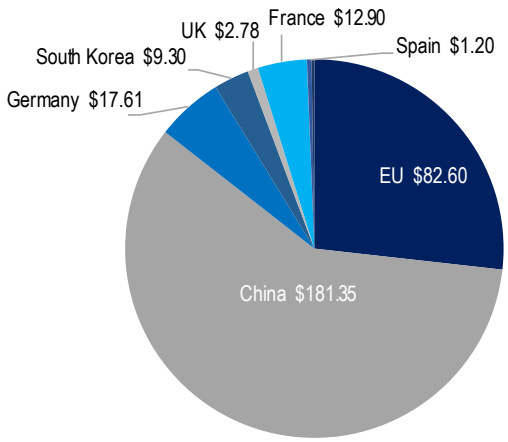
Source: IMF, Credit Suisse

Transport and infrastructure stimulus policies

The Transport and Infrastructure theme has six different policy sub-themes, dominated by EVs (US$157.50bn), EV charging infrastructure (US$86.05bn) and multi-modal (US$41.42bn), which includes policies such as building bike lanes or modernising railways and buses.

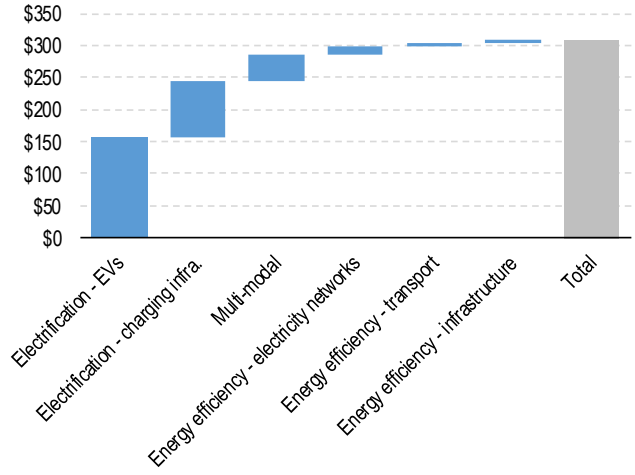
- **EVs dominate:** The green stimulus dataset includes various EV incentives, including tax exemptions (China, Germany and Indonesia) and subsidies (China and Italy), along with disincentives for petrol and diesel vehicles, such as emissions standards (Spain, Germany and the US). These EV stimulus policies, combined with an extensive charging infrastructure rollout globally (US$86.05bn shown in Figure 61), is a positive sign for the entire EV value chain. While most nations are focusing on incentivising the purchase and use of EVs, China is also investing substantially in EV manufacturing.
- **Air travel demand destruction:** Recently there has been a small but growing trend of environmentally conscience travellers seeking alternative modes of transport as a means of reducing emissions. The US$28.11bn stimulus dedicated to upgrading and decarbonising railways, buses and ships, could fast-track demand destruction of air travel as they become more efficient and accessible. France's €7.7bn aid to Air France specifically incorporates ending short routes that compete with trains.
- **Germany:** We estimate that Germany has announced US$17.6bn in transport Green Stimulus. Electric buses will see US$1.4bn in funding, public transport a further US$2.8bn and US$0.6bn is being invested in EV charging infrastructure. In particular, bail-out pledges have been formally tied to decarbonisation, with US$5.6bn equity injection in Deutsche Bahn contingent on railway modernisation and electrification and US$2.3bn for the autos industry contingent on deployment in "future technologies" (e.g. energy efficiency and EVs).

Figure 60: Transport and infrastructure green stimulus by country (US$bn)



Note: Chart does not show countries with <$1bn (Australia, US, Austria & Canada)
Source: Credit Suisse estimates

Figure 61: Transport and infrastructure green stimulus by sub-theme (US$bn)



Source: Credit Suisse estimates

Transport

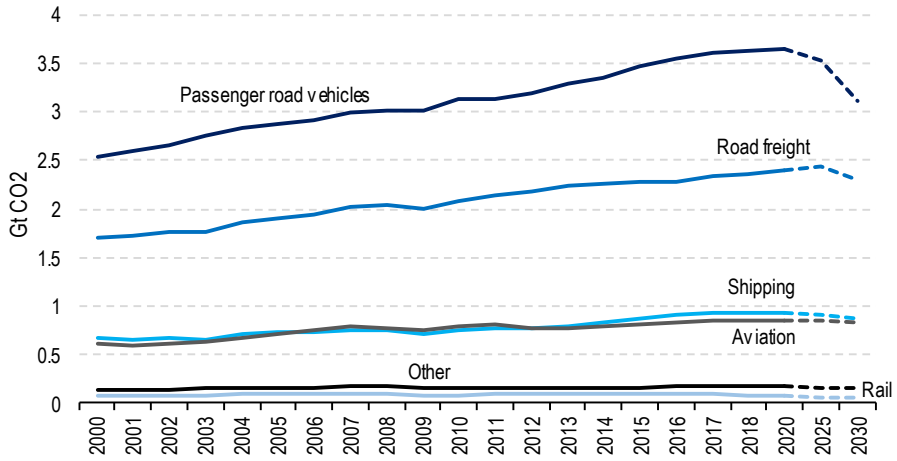
Thematic drivers

- The transport sector accounts for 57% of global oil consumption, including road vehicles, trains, aircraft and ships. The prevalence of liquid fuels in the sector means that transport also accounts for 24% of global CO_2 emissions (75% cars/trucks). To achieve necessary cuts in emissions by 2050, transport will play a significant role. However, on current global trajectories up to 2050, car ownership will triple to over 2bn, trucking activity will double,

and air travel could increase fourfold. Without a transformative shift towards electrification and energy efficiency solutions, these trends will lead to a doubling of transport energy use.

- Analysis by the IEA has shown that the implementation of incremental fuel economy and other mobility technologies could cost effectively cut fuel use and CO_2 emissions per kilometre of new LDVs worldwide by 50% by 2040. We are also seeing greater investments in fuel efficiency in the transport sector off the back of air pollution, energy security and independence concerns, rising household bills, urbanisation, congestion, and environmental concerns. Multi-modal options, such as buses, rail and urban walking and cycling infrastructure are seen as solutions, transporting more people farther and faster, with both lower emissions and congestion.

Figure 62: Transport sector CO_2 emissions by mode and the IEA's Sustainable Development Scenario, 2000-30



Source: IEA, Credit Suisse estimates

- **New vehicles improve fuel efficiency:** It is estimated that over one-third of the global car fleet is more than ten years old and the number of vehicles that are at least 16 years old will increase by 22% from 2018 to 2023 (IHS Markit). Without effective scrappage schemes or other consumer incentives, this embeds low fuel efficiency engines. Scrappage schemes also create direct manufacturing jobs by increasing new car sales, in car disassembly and metal recycling. Replacing a ten-year old ICE car with a new same class hybrid or EV car would result in a 40% and 80% reduction, respectively, in lifecycle CO_2 emissions in Europe (IEA). Based on today's electricity mix, emissions from an EV would be 60% lower than an ICE vehicle in the US and 40% lower in China. However, these abatement savings are likely to increase as the energy transition accelerates.

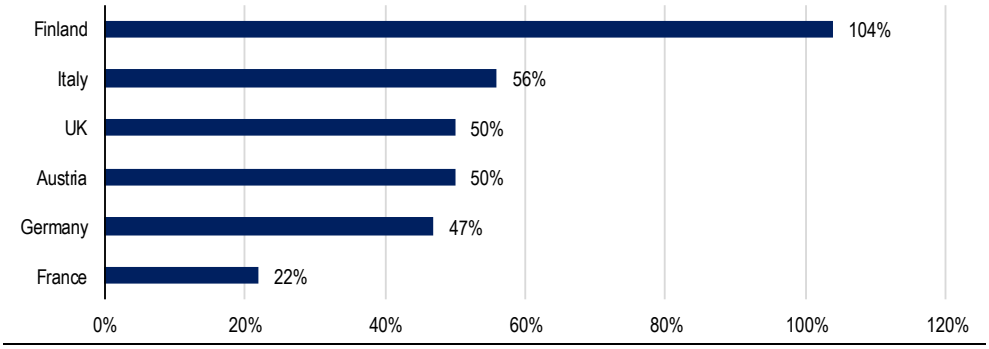
Figure 63: Technologies that can improve road-related energy efficiency

Transport	Infrastructure	Traffic Management	Information/Planning/ Payment
Driverless cars	Solar roads	Speed adaption solutions	Multimodal planning
Solar powered bus/trams	Automatic parking solutions	Cooperative collision avoidance systems	Controller Area Network based applications
Straddling train	Solar bus/tram stations	Advanced traffic management systems	Automatic payment systems
Electric cars	Green Wheel projects	Advanced parking system technology	Real time traffic information panels
Electric-bus/trams	Electric charging stations		RFID-based solutions
Hybrid cars	Automatic monorails		GPS services
Solar powered bus/tram stations	Third-rail based systems		

Source: Company data, Credit Suisse estimates

- **Accelerate the expansion of high-speed rail networks:** Rail travel is the most efficient transport mode for journeys under 800km (IEA, 2019d), and is on average >12-times more energy efficient than air and road travel per passenger kilometre. Around 20% of domestic flights in North America, 10% of flights in Europe and almost 8% of flights in Asia-Pacific could be displaced by high-speed rail (IEA, 2019d). The high-speed rail industry also aligns clearly with job creation from green stimulus, directly employing 420,000 people today, but also supporting 2.6mn construction and engineering jobs through network maintenance and expansion. The IMF estimates that government support to this sector will ensure the completion of announced projects, protect these jobs, but also creating an additional 220,000 jobs. Railways also support spatially balanced and decentralised economic development, something which may increase in importance if COVID-19 results in a moderate shift towards de-urbanisation.
- **Going multi-modal and improving urban transport:** The policy response to COVID-19 has inevitably re-invigorated community walking and cycling, with some cities also reallocating whole road spaces to pedestrians and cyclists. Payback periods for consumer purchase are typically less than six months for bicycles and up to two years for e-bikes. Active travel also provides a range of health benefits: for each dollar invested, the health benefits are >5x higher (UK Department of Transport, 2014). Globally, the public transport sector employs about 13mn people (UITP, 2011). Investment in public transport systems, including the electrification of city bus systems, would create around 30% more construction and engineering jobs than a similar level of investment in roads (Smart Growth America, 2011). While electric buses offer an efficient and flexible form of public transport, so far, only China has led the way, accounting for 95% of global electric buses (IEA, 2020f). China recently announced the extension of subsidy schemes for supporting electric buses to 2022 and plans to construct additional charging stations to support public transport electrification (MIIT, 2020).

Figure 64: Percentage increase in weekday bicycle activity in selected countries compared with pre-lockdown periods



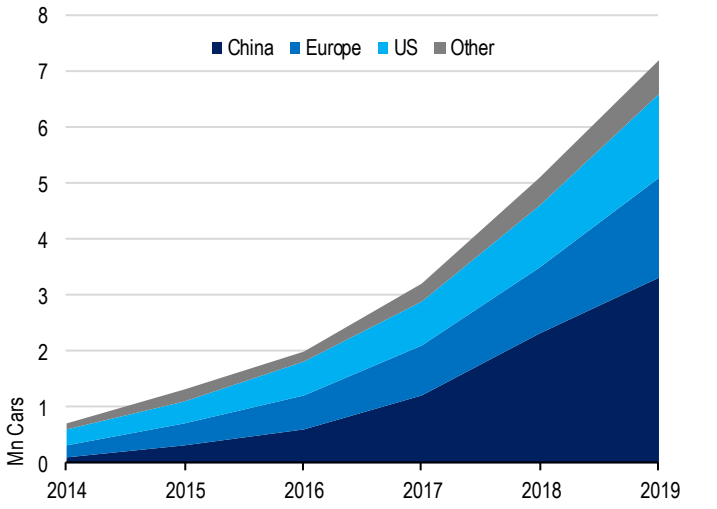
Source: IEA

- **An acceleration of EVs could transform the energy demand side:** Boosting demand for EVs, including fuel cell vehicles, would incentivise automakers to shift towards lower emission models and to pursue cost reductions in battery and fuel cell manufacturing: it could also lead to jobs in new domestic industries such as battery production. Fuel efficient and electric cars can be cost-effective purchases for consumers. At an oil price of $60/barrel, hybrid cars have a payback period of around six years. For electric cars, the payback period is around eight years. However, battery costs have declined by around 70% over the last five years and are expected to continue to fall, shortening payback periods.
- **Batteries:** The growth in battery manufacturing has shown rapid acceleration in recent years. The cost of lithium-ion batteries has declined sharply in recent years. In 2019, sales-weighted electric car battery pack prices reached an average price of $160 per kilowatt-hour (kWh), down from more than $1,100/kWh in 2010 (BNEF, 2019). At present there is capacity to produce around 320 GWh of batteries p.a. globally, with China the world leader

(70%), followed by the US (13%), Korea (7%), Europe (4%) and Japan (3%). Just meeting existing car manufacturers' targets for EV production would require an additional 1,000 GWh of capacity by 2025, however, recent green stimulus measures are already dominated by up to US$157.49bn of additional stimulus for EVs.

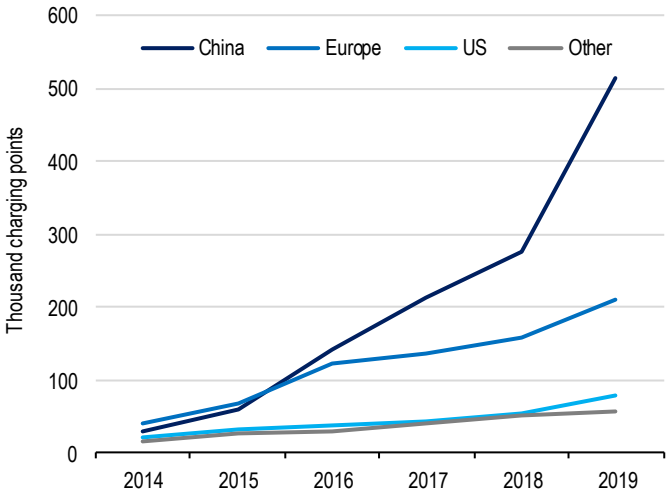
- **EV charging infrastructure:** The provision and availability of recharging infrastructure for EVs and electrified ride sharing (e-bikes, scooters, e-buses) is critical in penetration of electric mobility. For example, there is a strong correlation between the availability of charging infrastructure and the growth in the global EV fleet (see Figures 65 and 66). More extensive charging infrastructure therefore is an imperative for decarbonising mobility. Investment in charging points also supports job creation, with a good return of over 12 jobs per US$1mn investment. Globally, there are now over 1mn public recharging points as of May 2020, which represents a doubling in the number available in the last three years alone (BNEF). BloombergNEF expects one in ten vehicles purchased in 2025 will be battery-powered and by 2040, the world will need some 12 mn public charging points and almost $400 bn spent on infrastructure. EV charging infrastructure has also dominated green stimulus policy announcements to date, with already up to US$86.05bn announced in additional spending by governments.

Figure 65: Global electric cars in key markets, 2014-19



Source: IEA, Credit Suisse estimates

Figure 66: Public charging points in key markets, 2014-19



Source: IEA, Credit Suisse estimates

- **Grid investment as a lateral beneficiary from EV charging infrastructure build out:** Build out of EV charging infrastructure and, in particular, fast charging stations are expected to trigger demand for a broader grid infrastructure upgrade. According to our channel checks (Capital Goods Team), a station with five fast charging points has a similar demand on grid as a high rise residential block and a 'rule of thumb' suggested by industry players is that every dollar spent on EV charging infrastructure triggers a similar amount to be spent on grid upgrade. This suggests a $400bn global expenditure, including $86bn announced by green stimulus to date. Beneficiaries: Siemens, Schneider, ABB in Europe (GE in the US, Hitachi in Japan).

- **Aviation:** Although road-related emissions dominate the Sustainable Transport debate, we note that airlines are relevant too. For example, data from the European Environmental Agency suggest that despite an 80% improvement in fuel efficiency per seat kilometer for jet aircraft since 1960, in Europe the share of aviation-related CO_2 emissions in total transport emissions has increased almost 50% since 1990 to c13%. We note that the International Civil Aviation Organisation (ICAO) expects total passenger growth to average 4.3% p.a. until 2035 and 4.1% until 2045. Fuel remains the most significant portion of airline operating costs, representing on average 61% of the total for widebody and

narrowbody aircraft, creating a natural operating incentive to lower fuel consumption through light-weighting materials and engine efficiency enhancements.

Recent developments

- **China to treat EVs more favourably:** On 22 June the Chinese government announced that it would give more favorable treatment to hybrid electric vehicles (HEVs) by reclassifying them as "low-fuel consumption passenger vehicles." Our Japanese Automobiles & Components sector analysts believe this will be positive for Japanese automakers and auto parts suppliers, who are leading the way in HEV technology. Currently, automakers in China are obliged to make up for a portion of the "negative" points they incur when producing and selling gasoline or hybrid vehicles with points won for producing and selling NEVs. Under the amended rules announced this week, HEVs will be newly classified as low-fuel consumption passenger vehicles, and the negative points applied for producing and selling one HEV will range from one-fifth to a half of the minus points incurred for a gasoline-powered vehicle. The number of NEVs produced in compensation will thus likely be 20–50% of the number imposed for gasoline-powered vehicles. At Toyota Motor (7203), in 2019 HEVs made up 20% of global sales and 16% of China sales. Honda Motor (7267) has also reached a certain level with HEV sales, at 8% worldwide and 9% in China.
- **Demand for high voltage electricity has persevered through COVID-19:** Credit Suisse's US Auto Parts & Equipment sector analysts have found that Aptiv PLC's customers are more focused on producing EVs in volume, and that even through the COVID shutdowns, APTV has seen increased interest by customers on high voltage electricity. We believe there may be upside to APTV's high voltage electrification growth.
- **Copper to benefit from China's new EV stations:** China's 2020 investment focus on copper-intensive 'new infrastructure' includes, 5G networks, industrial internet, data centres, and new electric vehicle charging stations, partly offsetting demand destruction for copper in other sectors, according to our US Diversified Metals & Mining sector analysts.
- **Charging station targets in the EU:** According to Credit Suisse's European Energy sector team, the EU has announced that it will target 1mn EV charging stations to be installed by 2025 and Vattenfall and Hyundai have partnered to offer EV charging services in the Netherlands. Hyundai will offer 22kW charging points to customers at their home or business premise, while Vattenfall will offer a charge card for drivers to also use public charging stations. Daimler and Volvo have signed a preliminary non-binding agreement to establish a JV to develop fuel-cell solutions for heavy-duty vehicles. Tesla has also filed for a licence to be an electricity generator in the UK—such a licence is required for energy storage operators, potentially indicating plans to enter the UK.
- **EV adoption would create demand for gas pipelines and storage:** In the US, our Multi Utilities sector analysts find that electric vehicle adoption would arguably create plenty of fresh demand for gas pipelines and storage needed to support increasing amounts of intermittent renewables.
- **Zero emissions trains:** Our European Energy analysts noted that the European Commission included an investment of €40 -60bn in zero-emissions drive-trains, removing VAT from EV purchases, a 'Renaissance of Rail' package to promote shifts to rail for €40bn, and €66-80bn to support EV sales.
- **Rail systems to be upgraded in China:** China's infrastructure investment growth was up 2.3% YoY in April (vs. -11.2% YoY in March). Part of China's 'new infrastructure' stimulus package includes inter-city and inner-city rail systems; and charging stations for electric vehicles, according to our Korean Industrials sector analysts.
- **Ban on certain cars brought forward:** In the UK, Our European Energy sector analysts noted several announcements such as the ban on petrol, diesel and hybrid vehicle sales brought forward to 2035 (from 2040, and PM Johnson indicated that petrol and diesel may

face an earlier ban). In the US, we saw the establishment of biofuel targets from the USDA (15% in transportation fuels by 2030 and 30% by 2050).

- **OEMs still need to invest in new EV models/platforms:** In our APAC EV Themes Monitor, we find that for OEMs, despite near-term headwinds on overall business, the need for investment in new EV models/platforms and supply chain continues to remain as important as it was in a pre-COVID world. The Chinese government's decision to continue with NEV subsidy post 2020 (till 2022) definitely helps.
- **The Shenzhen municipal government announced new measures to support NEVs** (new energy vehicles) including Rmb20k/10k per unit cash subsidy for pure electric vehicle (EV)/plug -in hybrid vehicles (PHEV). Our China Auto sector analysts expect Shenzhen's NEV subsidy programme to benefit all NEV makers, especially BYD. BYD enjoys a high market share in Shenzhen (its headquarter city) with 25,490 units or 6% market share in 2019 (vs nation-wide market share of 1.8%).
- **French aerospace plan will support energy efficiency:** The French State would provide €1.5bn p.a. over five years for supporting innovation, in a bid to avoid R&D cuts in the industry. It would be targeted at energy efficiency (Green Aircraft) and Industry 4.0 (digitalisation, automation). This would be done for instance through demonstrators and joint funding of R&D programmes with the industry (usually on a 50/50 basis), according to our European Aero sector analysts.
- **Vattenfall** and **Hyundai** have partnered to offer EV charging services in the Netherlands: Hyundai will offer 22kW charging points to customers at their home or business premise, while Vattenfall will offer a charge card for drivers to also use public charging stations.

Beneficiaries of green stimulus

- **Tesla: COVID-19 disruption makes Tesla competitively better positioned in a 'Two Clocks' world.** CS recently upgraded Tesla to a Neutral rating, as it is increasingly more attractive on our 'Two Clocks' framework. It competitively has more edge in the transition to EV as coronavirus disruption will make it more difficult for legacy automakers to balance the long-term shift to EV in the face of near-term cycle disruption. In our 'Two Clocks' framework the auto industry is facing a challenge in balancing the 'near' (cyclical) with the 'far' (secular). We believe coronavirus disruption makes that balance all the more difficult: **(1)** Even pre-coronavirus legacy OEMs faced challenge in the transition to EV from combustion, with EV margin dilutive; **(2)** Long-term EV penetration intact, yet Tesla's competitive advantage in EV world increase as coronavirus disruption forces OEMs to make tough choices in product investment; **(3)** Tesla's advantages intact: battery lead, improved liquidity, and signs of improvements in execution.
- **STM (OP):** Over 2016-19, STM's sales have grown by 37% vs. a 24% growth in its SAM, and is on track to likely deliver another year of outperformance. This growth is driven by continued improvement in its product portfolio around SiC (silicon carbide), IGBT (insulated gate bipolar transistors), Radar and Vision sensors in Auto, MCU in Industrial, and Imaging, Wireless charging and RF in Smartphones. Given a long product cycle and ongoing design momentum, we expect STM to continue to outgrow its SAM by 1.5-2.0x and remain on track to reach $12bn sales by 2H22 or 2023.
- IGBT and SiC remain key technology for car electrification (both drivetrain and on-board charger). While STM has been lagging behind in IGBT, it has taken an early lead in the upcoming SiC technology since 2H17. At $200mn sales in 2019 (of which Tesla contributed ~$165mn), Silicon Carbide (SiC) remains a small contributor at 2% of group and 6% of Auto sales, but we remain confident that it has potential to generate over $1bn of sales by 2024. This will be driven by: (i) STM already having 64 ongoing projects (with 58 customers) in SiC with total contract value of over $3bn by 2024. With SiC sales likely to be around $275mn in 2020, over $3bn order value for the next five years supports our view of $1bn+ by 2024; and (ii) beyond Tesla, STM has already partnered with Hyundai-Kia and Renault-Nissan-Mitsubishi (RNM) for advanced on-board chargers in electric cars, which is

encouraging given Tesla, RNM and Hyundai-Kia are the top 3 full or battery EV car makers globally accounting for 42% of unit production in 2019.

- **IFX (UP):** IFX is well placed to benefit from secular trends in car electrification, industrial automation and Internet of Things (IoT) connectivity, which should drive healthy top-line growth of close to 10%. Although we maintain an UP rating on IFX, our view is mainly driven by lofty expectations and valuation as we think the stock looks 'priced for perfection' (pricing in 10% p.a. top line growth beyond FY20, with mid-term margins reaching close to 19%).

- Exposure to car electrification (7% of group sales pre Cypress acquisition), advanced safety sensors in cars (8%), renewable energy (3%) and high speed Rail (2%)—so 20% in total pre Cypress deal, 15%+ in total post Cypress deal—means that IFX stands to benefit from multiple Green Stimulus end-markets. Further, it has been a market leader in car electrification globally with its IGBT technology for drivetrain and onboard chargers used in a number of electric/hybrid models. Although in the new SiC technology, it lost its market leading position due to delayed product launches, it has a number of new product launches and customer wins in the pipeline. We model its xEV and ADAS-related sales in the Auto segment to grow from €850mn in FY20 to €1.5bn in FY22.

Figure 67: Key global CS rated Neutral or Outperform exposures to transport energy efficiency

Company	TP	CS TP Upside	CS Rating	MC (US$ bn)	P/E		Sales	Earnings	Quality	Momentum	Business Sustainability	Refinitiv ESG Momentum
					12MF	12MF/5Y median	Consensus '20-22' CAGR		Percentile rank			
Boeing	US$154	-11.9%	N	98.6	na	na	20%	na	70	1	50	7.3%
Raytheon Technologies	US$81	32.90%	O	93.1	17.3	4%	7%	34%	77	17	51	10.2%
Airbus SE	€78	9.00%	O	66.4	32.5	80%	12%	227%	40	4	54	2.4%
General Electric	US$7	6.22%	N	57.7	30.1	80%	5%	na	42	33	53	-0.3%
Safran	€87	-12.44%	N	47.1	27.0	41%	11%	41%	67	10	53	10.9%
Cummins Inc.	US$244	16.16%	O	31.0	19.0	41%	10%	23%	71	91	55	-5.2%
Aptiv PLC	US$91	6.61%	O	23.0	31.0	126%	16%	109%	70	64	55	8.8%
Thales	€78	13.37%	N	17.3	12.9	-24%	6%	28%	48	14	58	12.1%
Magna International Inc.	US$62	22.46%	O	15.4	12.6	63%	12%	82%	50	77	53	13.6%
Alstom	€37	-23.08%	N	12.9	23.1	25%	6%	22%	57	44	53	1.7%
Solvay	€76	4.37%	N	9.1	12.0	-1%	5%	12%	28	33	59	6.2%
BorgWarner, Inc.	US$40	-2.44%	N	8.5	13.8	31%	14%	40%	63	78	59	4.7%
Lear Corporation	US$143	24.08%	O	6.9	12.7	45%	13%	128%	77	73	56	21.8%
Hexcel Corporation	US$47	16.63%	O	3.4	31.5	66%	7%	49%	53	8	48	23.1%
Dana, Inc.	US$18	29.31%	O	2.0	11.2	46%	13%	222%	63	53	43	0.0%
Delphi Technologies PLC	US$16	-8.20%	N	1.5	18.9	175%	11%	na	43	72	49	0.7%
Indra	€7	9.70%	N	1.3	10.9	-21%	4%	61%	50	29	41	-10.4%
American Axle & Manufacturing Holdings	US$8	7.24%	N	0.8	na	na	8%	na	55	73	44	47.5%

Source: Company data, Credit Suisse estimates

Figure 68: Key global CS rated Neutral or Outperform exposures to the shift to multi-modal transport

Company	TP	CS TP Upside	CS Rating	MC (US$ bn)	P/E		Sales	Earnings	Quality	Momentum	Business Sustainability	Refinitiv ESG Momentum
					12MF	12MF/5Y median	Consensus '20-22' CAGR		Percentile rank			
Canadian National	US$102	-3.93%	O	75.5	23.0	26%	8%	15%	38	66	58	0.0%
CSX Corporation	US$83	9.46%	O	58.0	18.9	11%	6%	15%	42	49	56	-5.9%
Aena	€131	6.94%	O	21.7	31.8	69%	30%	na	32	9	47	66.0%
China Railway Group Limited	HK$7	74.00%	O	18.6	3.7	-47%	10%	11%	35	47	51	0.0%
Weichai Power	Rmb18	14.50%	O	17.8	11.8	6%	6%	10%	58	76	55	-2.2%
China Railway Construction Corporation Limited	HK$13	103.08%	O	16.5	3.3	-45%	10%	10%	33	46	43	-11.3%
Alstom	€37	-23.08%	N	12.9	23.1	25%	6%	22%	57	44	53	1.7%
Zhuzhou CRRC Times Electric Co., Ltd	HK$26	-13.33%	N	4.5	10.6	-16%	9%	10%	70	39	49	3.1%
Guangshen Railway	HK$2	50.63%	O	2.3	18.3	5%	9%	100%	15	31	63	1.1%
Applus	€8	17.48%	O	1.2	13.9	-1%	3%	28%	41	13	49	0.2%

Source: Company data, Credit Suisse estimates

Figure 69: Key global CS rated Neutral or Outperform exposures to the shift to electrification

Company	TP	CS TP Upside	CS Rating	MC (US$ bn)	P/E		Sales	Earnings	Quality	Momentum	Business Sustainability	Refinitiv ESG Momentum
					12MF	12MF/5Y median	Consensus '20-22' CAGR		Percentile rank			
Tesla Inc	US$1400	-30.81%	N	377.1	na	na	33%	63%	22	98	41	42.9%
Nidec	¥8700	-1.20%	O	48.5	44.2	69%	9%	30%	42	69	52	13.1%
Analog Devices Inc.	US$150	25.10%	O	44.3	22.2	21%	na	na	96	84	59	1.8%
General Motors Company	US$34	14.52%	O	42.5	8.0	34%	7%	50%	34	68	55	3.3%
Murata Manufacturing	¥7600	18.75%	O	38.5	22.0	28%	8%	21%	39	54	51	3.7%
Infineon Technologies AG	€19	-16.23%	U	35.4	25.8	34%	13%	32%	29	76	60	-1.9%
Ford Motor Company	US$8	15.27%	N	32.5	28.8	306%	12%	na	23	68	55	9.9%
Denso	¥5000	15.31%	O	31.6	23.0	71%	6%	84%	12	28	61	-3.5%
STMicroelectronics NV	€30	18.44%	O	27.3	24.0	31%	11%	44%	20	83	62	3.7%
Hyundai Mobis	W260000	18.45%	O	17.6	8.6	11%	11%	27%	46	27	51	-8.2%
Renesas Electronics	¥1290	89.15%	O	11.0	29.3	44%	5%	44%	18	79	50	-0.3%
Aisin Seiki	¥4250	16.76%	O	9.2	18.8	59%	6%	120%	14	44	50	50.6%
MinebeaMitsumi	¥2400	28.62%	O	7.5	16.0	34%	3%	20%	23	72	49	-5.9%
Albertsons Cos	US$18	23.37%	O	7.0	7.9	-2%	-1%	na	21	67	52	na
ROHM	¥9000	26.94%	O	6.5	32.4	46%	6%	45%	7	30	56	0.0%
Hanon Systems	W13000	-0.38%	O	5.9	25.3	51%	11%	65%	49	50	47	40.6%
SUMCO	¥1435	-1.58%	N	4.0	13.5	-8%	5%	17%	16	45	49	0.0%
Taiyo Yuden	¥4200	41.60%	O	3.5	15.1	9%	7%	28%	23	47	48	9.8%
Keihin	¥2600	0.89%	N	1.8	18.2	84%	na	na	19	67	52	na
GS Yuasa Corp	¥2500	40.69%	N	1.3	11.8	-13%	4%	6%	19	36	51	44.8%

Source: Company data, Credit Suisse estimates

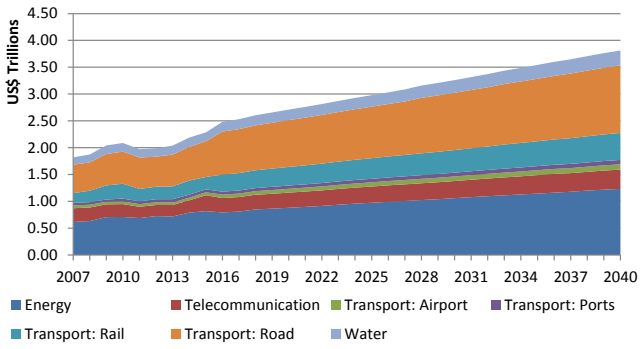
Infrastructure

Thematic drivers

The theme of Infrastructure covers four distinct areas, in our view. These are Power, Buildings, Transport and Communication. The need to invest in Infrastructure globally is high, with developed markets in need of refurbishment whereas emerging countries simply do not have sufficient infrastructure to begin with. Infrastructure is relevant to many SDGs.

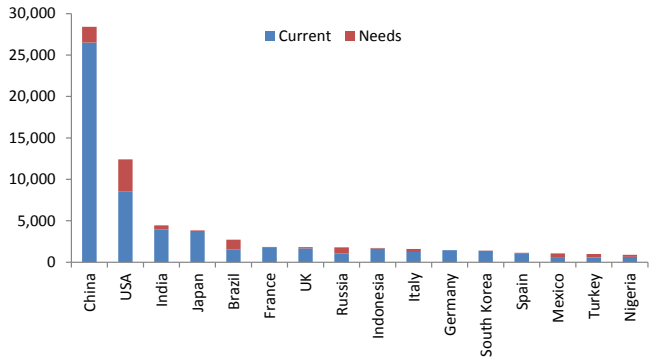
Firstly the lack of modern infrastructure across the relevant four areas is a major impediment to economic growth and health. In addition, the lack of proper sanitary infrastructure impedes access to clean water and sanitation. Modern transport infrastructure meanwhile supports the sustainable agenda as it helps to shift commuting to less polluting modes of transport. Building infrastructure includes the construction of offices and retail but also public buildings including schools. The lack of facilities is a clear hurdle to providing access to good quality education. These are but a few of the links that infrastructure has to SDGs 3, 4, 6, 7, 8, 9 and 11.

Figure 70: Global annual investment needs in infrastructure set to rise until 2040



Source: Company data, Credit Suisse estimates

Figure 71: Infrastructure investments by country: current trend vs needed, 2016-40 (US$bn)

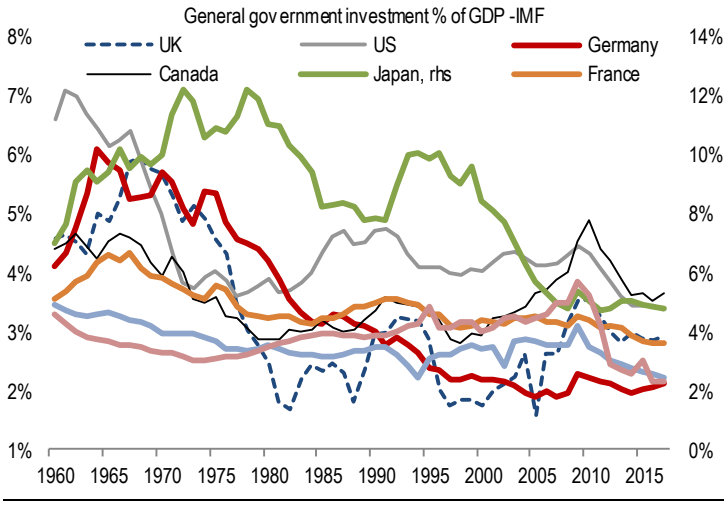


Source: Company data, Credit Suisse estimates

The investment requirements in relation to infrastructure globally are very substantial. The Global Infrastructure Hub published a report in 2017 analysing the infrastructure investment needs for 50 countries and seven sectors to 2040. They forecast that globally US$94tn needs to be invested in infrastructure across these countries and sectors by 2040 with a further US$3.5tn if the UN SDGs for electricity and water are to be met as well.

Investments in electricity-generating capacity and roads are the most significant areas of infrastructure investments as they comprise almost two-thirds of total spending. Spending for the seven sectors combined has averaged c3% of GDP since 2007. However, calculations from the Global Infrastructure Hub suggest that this needs to increase to c3.5% in order to meet long-term requirements.

Figure 72: Public infrastructure spending has been declining over time…



Source: IMF, Refinitiv, Credit Suisse

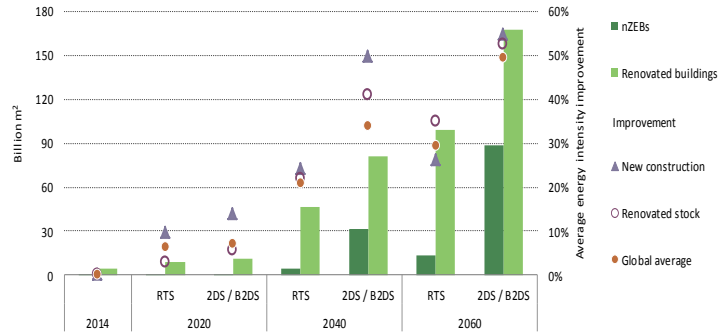
Figure 73: …with many major developed markets spending around 30% below their norm (since 1960)

	General government investment, as % of GDP		
	Current	Average	% below average
UK	2.9%	3.3%	11.4%
US	3.4%	4.5%	25.1%
Japan	4.8%	8.5%	43.7%
Germany	2.1%	3.4%	38.0%
Canada	3.6%	3.6%	-0.3%
France	3.6%	4.8%	25.4%
Italy	2.4%	3.5%	31.4%
Spain	2.3%	3.8%	38.7%

Source: Refinitiv, Credit Suisse

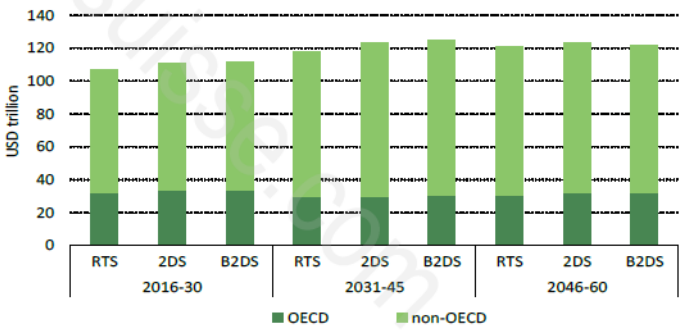
The countries that face the highest investment requirements are China (US$28.4tn), the US (US$12.4tn) and India (US$4.5tn). However, as far as current trends relative to required investments is concerned, we point out that countries such as Mexico, Brazil, Russia, Turkey and the US are currently underinvesting the most and would have to increase annual investments by between 46% and 104% in order to meet long term requirements.

Figure 74: Required building (re)construction needed to meet global warming targets



Source: IEA, World Green Building Council

Figure 75: US$ investment requirements needed to meet long-term warming targets



Source: IEA, World Green Building Council

Beneficiaries of green stimulus

Figure 76: Key global CS Neutral or Outperform rated stock exposures to the shift to infrastructure—construction

Company	TP	CS TP Upside	CS Rating	MC (US$ bn)	P/E		Sales	Earnings	Quality	Momentum	Business Sustainability	Refinitiv ESG Momentum
					12MF	12MF/Yr median	Consensus '20-22' CAGR		Percentile rank			
CRH	€41	26.15%	O	30.2	16.1	7%	7%	17%	26	66	43	-1.2%
LafargeHolcim	SFr61	40.59%	O	29.4	14.1	-2%	5%	16%	24	61	54	4.8%
Bouygues	€34	2.07%	O	15.0	14.5	-3%	4%	43%	33	33	49	6.4%
CIMIC Group Limited	A$34	55.04%	O	5.0	10.1	-42%	0%	6%	89	14	59	18.3%
Cleanaway Waste Management	A$2	-5.15%	N	3.6	29.0	19%	5%	16%	38	54	39	na
Downer EDI	A$5	8.80%	O	2.2	10.9	-20%	3%	22%	39	12	50	na
Bingo Industries	A$2	3.00%	N	1.1	34.2	75%	14%	41%	62	44	30	na
Ambuja Cements	Rs250	10.25%	O	6.0	21.5	-2%	12%	11%	27	75	65	0.0%
Ultratech Cement	Rs4800	14.41%	O	16.2	29.8	2%	10%	21%	34	65	49	6.1%

Source: Company data, Credit Suisse estimates

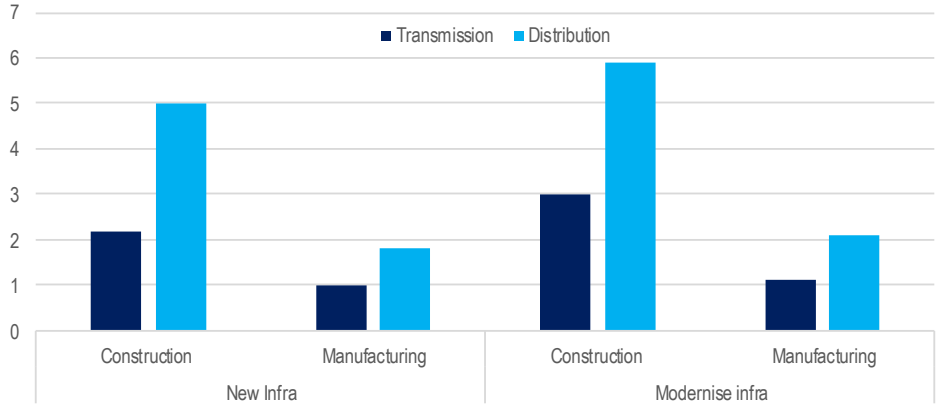
Energy networks

The impact of COVID-19

Over 5mn people were employed globally in 2019 to construct, operate and maintain electricity transmission and distribution networks (IMF, IEA). Delays caused by lockdowns will inevitably affect project timelines in 2020: spending on grids is therefore likely to decline in the absence of any targeted support from Green Stimulus.

Investment in electricity and smart grid networks was around US$270 bn globally in 2019, with spending on distribution networks representing two-thirds of investment, and investment in digital grids representing 15% (IMF, IEA). One attraction of investing in improvements in the grid is that over a third of skilled engineers are set to retire within the next ten-year period, representing 35% of retirements up to 2024 (Center for Energy Workforce Development).

Figure 77: Average jobs created globally per US$1mn of spending on electricity grids



Source: IEA

Green stimulus has a strong payback in jobs, for every US$1mn invested in modernising distribution lines creates six jobs for a one-year construction phase, and two jobs in manufacturing. Investment in smart grids would create additional employment for a range of skills and support the development of new skills.

Thematic drivers

- **Economic and emissions productivity enhancements:** Losses from the transmission and distribution of electricity through inefficient faltering networks comes at an energy and emissions cost, with additional electricity generated to service the same level of demand. It is estimated that losses in grids resulted in around 1 Gt CO_2 emissions in 2018. The IEA estimates that reducing worldwide losses towards efficient levels of around 5% from as much as 18% in some regions would reduce these avoidable emissions by >400 Mt CO_2. Options to reduce these losses include replacing transformers and power lines, and optimising the reactive power profile. I
- **Going smart is an enabler of resilience:** The digitalisation of electricity networks improves reliability and grid optimisation and, as a result, reduces operating costs. Investment in smart and secure networks also helps diversify the power mix and reduces the risk of power outages and losses in the future. Investments in smart grids would facilitate further CO_2 abatement by reducing load peaks, better management of load shifting, better integration of renewables, thus supporting the adoption of EVs and improving energy efficiency. In many developing economies, investment is particularly needed to increase the reliability of the network, support the connection of renewable energy and displace polluting diesel generation.
- **Accelerates the growth of renewables:** Investments in smart grids would facilitate further CO_2 emissions reductions by reducing load peaks, load shifting, facilitating the integration of renewables generation, supporting the adoption of electric vehicles and improving energy efficiency.
- **Weather extremes:** The next phase of electricity grid investment will need to embed resilience to an increase in the number of extreme weather events. It is estimated, that globally US$40bn of damages have resulted from such extreme weather episodes between 2015 and 2017 alone at the global level. Investment is needed to safeguard electricity systems and to increase resilience in the face of these climate change threats.
- **Cyber security:** Investing in smart grid technologies is also an important enabler of cybersecurity adaptation to the number of devices and software added to the grid, set to reach 54.4bn by 2025 (Statista). In this context, there are 1mn new types of malware introduced each day. Investment is needed to increase resilience in the face of these cyber threats.
- **Adapting to ageing infrastructure:** In 2020, 70% of the dams in the US will be more than 50 years old, according to the American Society of Civil Engineers. The 50 oldest electricity plants in the United States are all hydroelectric generators; each has been in service since 1908. Furthermore, according to the US department of energy, 70% of power transformers are 25 years old or older; 60% of circuit breakers are 30 years or older; and 70% of transmission lines are 25 years or older.

Beneficiaries of green stimulus

Figure 78: Key global CS Neutral or Outperform rated exposures to energy networks

Company	TP	CS TP Upside	CS Rating	MC (US$ bn)	P/E		Sales	Earnings	Quality	Momentum	Business Sustainability	Refinitiv ESG Momentum
					12MF	12MF/5Y median	Consensus '20-22' CAGR		Percentile rank			
Enel	€8	-0.05%	O	93.9	14.8	21%	3%	7%	14	59	48	0.0%
Enbridge Inc.	C$48	11.52%	N	66.2	16.3	-16%	6%	10%	43	48	41	-1.9%
Brookfield Asset Management	US$43	26.19%	O	50.9	27.6	13%	0%	537%	24	27	68	-8.4%
TC Energy	C$65	1.58%	N	45.7	15.4	-9%	6%	3%	31	51	32	-12.1%
Eaton Corporation	US$102	-0.80%	O	41.1	22.5	55%	4%	20%	71	81	54	-0.5%
National Grid	p1040	19.07%	O	40.4	15.9	7%	4%	6%	18	38	35	-5.9%
E.ON	€11	4.48%	O	31.7	14.8	10%	-1%	18%	16	54	26	0.0%
Fortis Inc.	C$58	9.41%	N	18.7	19.3	10%	na	5%	25	49	36	3.4%
Terna	€6	-7.41%	N	15.2	16.5	11%	3%	2%	14	56	37	4.9%
CK Infrastructure	HK$56	33.65%	O	14.3	11.8	-16%	2%	6%	34	19	45	113.5%
Pembina Pipeline Corporation	C$40	17.37%	O	14.2	15.1	-24%	11%	10%	30	26	28	20.6%
Powergrid Corporation	Rs220	19.08%	O	13.0	8.2	-18%	6%	10%	33	42	45	-2.6%
Hydro One Limited	C$28	1.01%	N	12.6	18.7	4%	4%	3%	24	67	38	21.1%
CenterPoint Energy Inc	US$22	9.95%	O	10.9	15.3	-11%	1%	6%	28	37	34	13.8%
Emera Inc.	C$60	11.40%	N	10.1	18.5	6%	4%	9%	23	47	34	20.1%
Prysmian	€17	-26.82%	N	7.4	18.2	31%	5%	33%	40	67	45	13.2%
Canadian Utilities Limited	C$38	11.81%	O	7.0	16.4	0%	0%	8%	21	42	52	2.5%
AusNet Services	A$2	-0.54%	N	5.0	26.5	13%	0%	-3%	23	51	31	11.1%
Keyera Corp.	C$28	14.99%	O	4.1	17.7	-13%	8%	27%	35	23	46	81.7%
AltaGas Ltd.	C$18	1.07%	N	3.8	13.4	-41%	11%	10%	20	59	48	39.5%
Spark Infrastructure Group	A$3	19.37%	O	2.7	50.7	32%	-9%	-5%	16	35	54	28.2%
Nexans	€39	-17.06%	N	2.4	16.1	23%	4%	51%	9	77	48	27.1%
Calisen Plc	p230	38.47%	O	1.2	23.7	-32%	6%	na	38	21	44	na
NKT	Dkr126	-36.20%	N	1.0	na	na	17%	na	18	91	39	5.5%

Source: Company data, Credit Suisse estimates

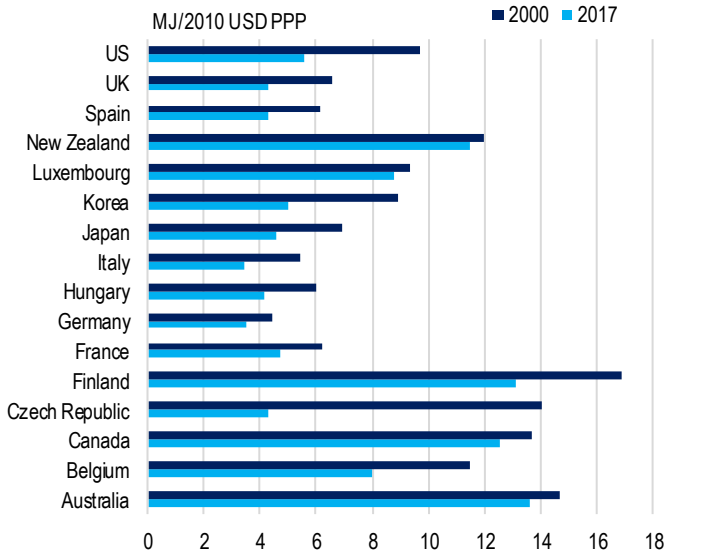
Energy efficiency

Energy efficiency is at the heart of securing sustainable economic growth. It is one of the most cost-effective ways to enhance security of energy supply, improve productivity, and to reduce carbon intensity. Energy efficiency has multiple benefits, such as reducing energy bills, addressing climate change and air pollution, improving energy security and increasing energy access. The energy transition will not only require a rebalanced energy mix, but a transformation in the "first fuel" of energy efficiency savings across energy systems, buildings, lighting and industrial processes.

We believe that efficiency is the cheapest and easiest way to reduce energy demand and CO_2 emissions. To demonstrate the power of efficiency savings, primary energy intensity in 2018 improved by only 1.2% (a moderate slowdown from a- term trend). However, this resulted in a US$1.6tn saving to global GDP compared to the spending on energy in 2017. A 3% improvement in energy intensity p.a. globally since 2015, would equate to a global GDP saving of US$4tn, an amount greater than the size of the German economy.

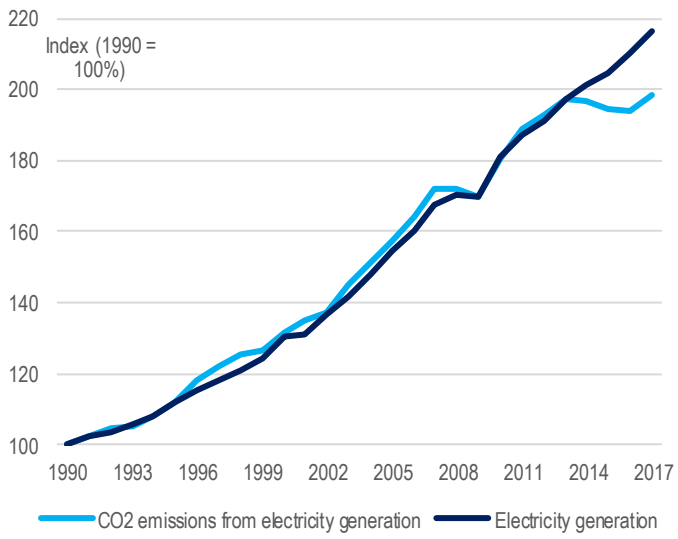
At US$240 bn, incremental efficiency investments across the buildings, transport and industry sectors were about 0.6% higher in 2018 than in 2017, but still well below the levels required to capture the cost-effective opportunities available for government through green stimulus. It is estimated that US$550bn+ in annual spending will be required per annum up to 2035 to meet growth in energy demand and meet emission abatement targets (source: IEA). With 80% of energy lost along the value chain, there remains a range of opportunities to improve efficiencies: every dollar spent translates to US$2-4 in lifetime savings, and two-thirds of the economic potential to improve energy efficiency remains untapped (source: ABB, IEA).

Figure 79: Energy intensity of manufacturing, 2000-17



Source: IEA, Credit Suisse estimates

Figure 80: Electricity generation and related CO_2 emissions



Source: IEA, Credit Suisse estimates

Energy efficiency stimulus policies

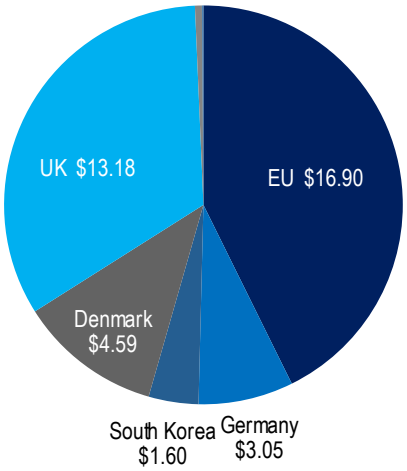
We find 18 different Energy Efficiency policies under two sub-themes, including industrials (US$28.71bn), which includes supporting businesses and building low-carbon facilities, and buildings (US$16.03bn), which includes renovations and retrofitting, among other solutions.

- **Buildings:** We have analysed US$16.03bn of green recovery policies focusing on improving the energy efficiency of buildings, US$6.19bn of which focuses on social housing and public buildings while the remaining US$9.84 is dedicated to supporting residential homes. The policies propose renovating, replacing or building new insulation, double-glazed windows, fire heating systems and heat pumps. The UK has chosen to stimulate residential

renovations through a £2bn "green homes grant" scheme which will cover up to two-thirds of the cost of work. These grants will provide vouchers to install energy saving measures including solid wall, under-floor, cavity wall or roof insulation; air source or ground source heat pump (where the home has, or is installing, insulation); and solar thermal. This is part of a UK government proposal to invest £9.2bn into energy efficiency in Nov-2019. While we only include the £2bn as confirmed funding at this stage, it is clear that additional funding is earmarked for energy efficiency projects in the UK. Biden's proposed stimulus for the US includes government spending (retrofitting 2mn homes), building 1.5mn new sustainable housing units, and creating incentives for retrofits that combine appliance electrification, efficiency, and on-site clean power generation. Biden has also proposed using regulatory measures such as appliance- and building-efficiency standards, targets to reduce the carbon footprint of US building stock by 50% by 2035, and setting a new net-zero emissions standard for all new commercial buildings by 2030.

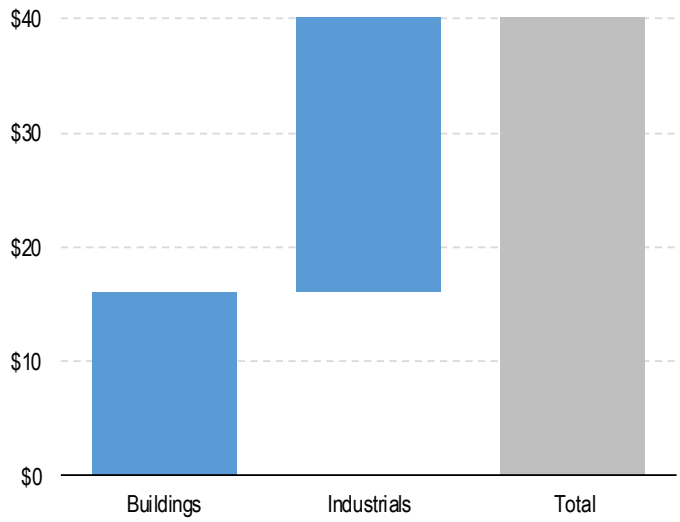
- **Industrials:** To complement stimulus for residential housing, there has been US$23.56bn to improve the energy efficiency of industry and business. These policies vary greatly with some focusing on funding construction (UK), agriculture (EU) and sustainable business models (South Korea); while others are encouraging lower energy use during peak periods to facilitate renewable energy (Australia). Biden's energy efficiency policies are some of the most extensive and aim to make industrial processes more energy efficient, including funding the modernisation of textile machinery and metal fabrication. Biden has also stated that the US would allocate tax credits and subsidies for businesses that upgrade equipment and processes, invest in expanded or new factories, or deploy low-carbon technologies.

Figure 81: Energy efficiency green stimulus by country (US$bn)



Note: Chart does not show countries with <$1bn (Brazil, Canada & Italy).
Source: Credit Suisse estimates

Figure 82: Energy efficiency green stimulus by sub-theme (US$bn)



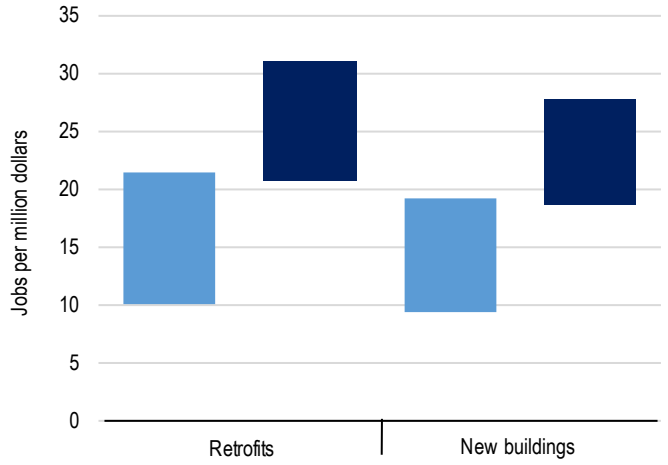
Source: Credit Suisse estimates

Buildings

The impact of COVID-19

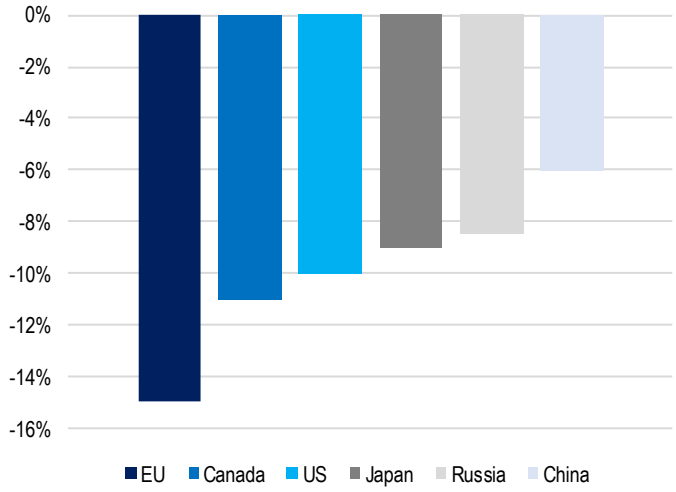
COVID-19 has substantially reduced construction activity in the buildings sector. Absent additional Green Stimulus, investment in building construction is estimated to decline between 20% and 30% in major advanced economies in 2020 (IMF, IEA). More than 25mn jobs across the sector have been lost or are at risk in 2020, due to COVID-19 related disruptions. As an employer of c.10% of the global workforce today (construction and manufacturing), investment in building energy efficiency can play a critical role in stimulating economic recovery.

Figure 83: Retrofits and new construction efficiency measures create jobs and…



Source: IEA

Figure 84: …reduce consumer bills for space heating by as much as 15%.



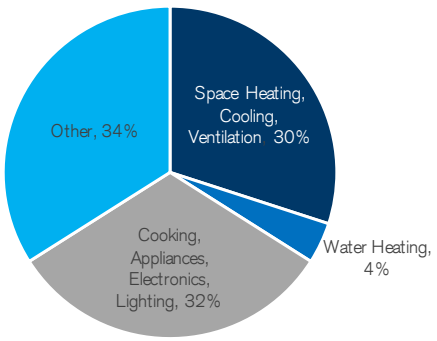
Source: IEA

Thematic drivers

With buildings accounting for 39% of global GHG emissions by source, consisting of Building Operations (28%) and Building Materials & Construction (11%) and 30% of energy-related CO_2 emissions, investment needs to accelerate significantly if the world is to meet its sustainable development goals. HVAC represents 30% of emissions in commercial buildings and 38% of emissions in residential buildings.

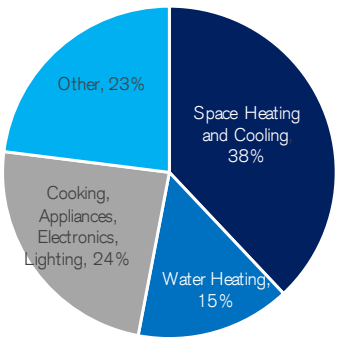
Direct and indirect emissions from electricity and commercial heat used in buildings rose to 10 $GtCO_2$ in 2019, the highest level ever recorded. Several factors contributed, including heating and cooling, which, together with lighting, can account for as much as 60% of overall energy consumption in buildings. Electronics (lighting, appliances, cooking) represent 32% of emissions in commercial buildings and 24% in residential buildings. Absent additional policy measures, energy demand from buildings is expected to increase by >60% by 2040E (source: IEO2013).

Figure 85: Total CO_2 emissions from commercial buildings (2016)



Source: US Energy Information Administration

Figure 86: Total CO_2 emissions from residential buildings (2016)



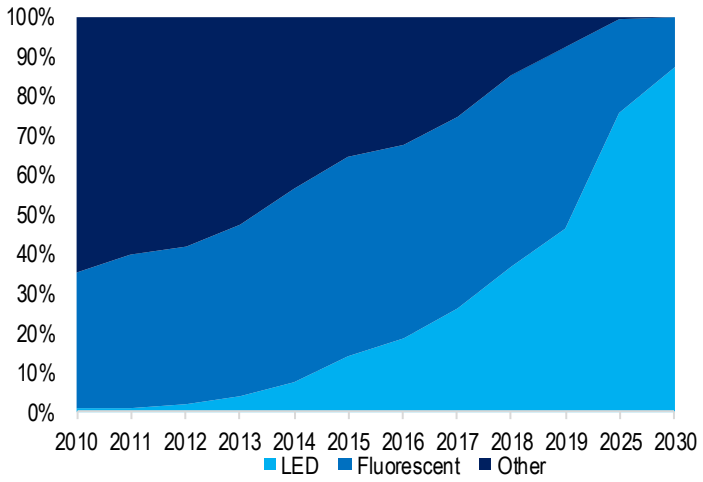
Source: US Energy Information Administration

It is estimated that improved energy efficiency in the buildings can reduce energy use by 50% and, in turn, operating costs by 30%. The average payback periods offer a compelling IRR, with

efficient building technologies recovering electricity costs in only three years, and fuel costs in 9-14 years. But most compelling is the scope of opportunity, with 80% of the economic potential of energy efficiency in buildings remaining largely untapped (IEA). Longer-term drivers are also favourable, and include: an ageing building stock; "renovation nation"/DIY during COVID-19 lockdowns; urbanisation; emerging economies' growth; affordable housing; and the increasing recognition of a financial premium on green buildings (valuations, rents and tenant retention); and the economic importance of the sector in terms of GDP and jobs.

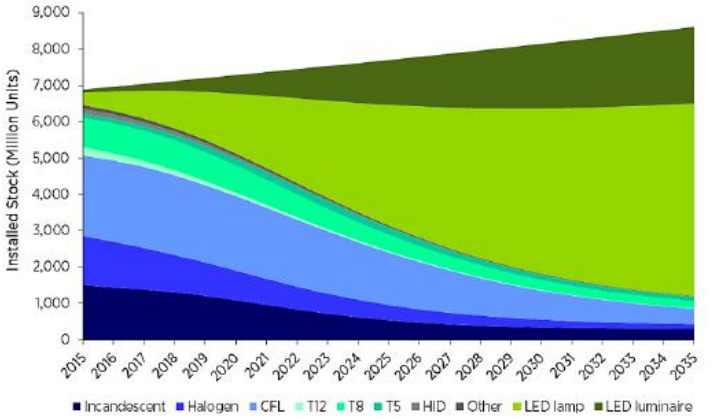
- **Lighting:** Lighting represents 19% of global electricity consumption and c.8% of global CO_2 emissions. However, between 30% and 75% of lighting systems are considered inefficient (IEA); making LEDs an efficiency game changer, offering 25% the consumption and 20x+ the lifetime of traditional lighting. LED adoption could lead to annual energy savings in the US of 300TWh by 2030E, equivalent to saving 210MMT of CO_2 (US DoE). From 2010 to 2030, the cumulative energy savings from LED adoption could be nearly 2,700TWh, representing 800MMT of CO_2 (US DoE). Per the US Department of Energy's forecast (2018), LED adoption will reach >50% market penetration across all major commercial categories by 2025.

Figure 87: Lighting sales by type in the Sustainable Development Scenario, 2010-30



Source: IEA, Credit Suisse estimates

Figure 88: US installed lighting stock projections for solid-state lighting in the US



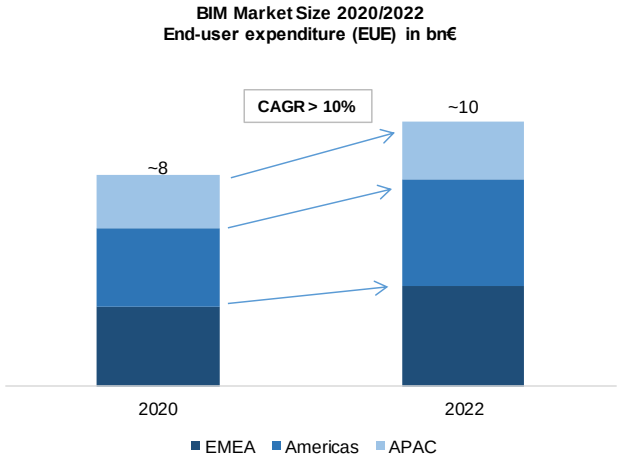
Source: US Department of Energy

- **Retrofits/new-builds:** Retrofits have a crucial role in energy efficiency: in several major economies, older buildings are expected to reach 80% of the stock of housing by 2030. Energy retrofits of old buildings are particularly effective in reducing energy demand linked to heating, which can see reductions as high as 70%. Retrofitting 20% of buildings in advanced economies over the next five years would reduce CO_2 emissions from space heating by around one-fifth (IEA). Further energy and emissions savings can be achieved through insulation and heat pumps. In countries where the building stock is expanding rapidly, it is also important to ensure that new buildings are constructed under efficiency measures. However, average annual energy retrofit rates are currently less than 1% in most major markets. One reason for this is that governments and states have not always applied building codes' efficiency requirement to existing stock, with most buildings in advanced economies built before there were effective building codes. Despite impressive economic and environmental returns, less than one-third of countries globally have mandatory energy-related codes for new construction.
- **Smart and efficient households:** Building efficiency solutions encourage electrification and the use of smart energy systems, which also serves to strengthen the resilience of electricity systems and enable integration of smart devices and on-site renewables. This is important as household appliances (e.g. refrigerators, washing machines, and connected devises) account for 25% of global electricity consumption today (IEA). However, air

conditioners account for an additional 8% of total electricity demand, which is expected to have seen increases through COVID-19 lockdowns, and are one of the fastest sources of demand growth, increasing by c. 25% between 2015 and 2019 alone. Replacing old household appliance with newer, higher efficiency appliances would cut consumer spending on electricity by around 30-50%, which could be a strong motivator for government policies in emerging markets. It is estimated that replacing 25% of the world's least efficient appliances would reduce emissions by >300 Mt CO_2 (IMF, IEA).

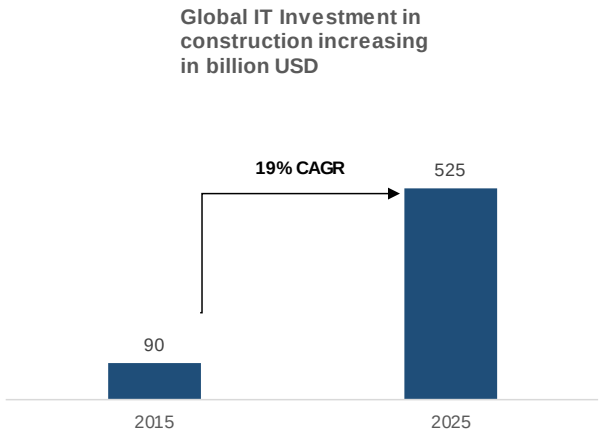
- **Rising IT and Software penetration in buildings**. Our Capital Goods team expects the drive for higher buildings energy efficiency to stimulate demand for: (1) Industrial IoT penetration in buildings with platforms such as Schneider EcoStruxure being implemented in order to collect data on building operations, develop optimisation solutions and implement them into operations and (2) driving higher penetration of Architecture, Engineering & Construction software such as 5D BIM for new and renovation projects' planning and execution in order to improve efficiency and precision of implementation (Link to recent Schneider note with first dive into BIM space).

Figure 89: BIM market size—forecast to grow >10% CAGR between 2020 and 2022



Source: McKinsey, Nemetschek

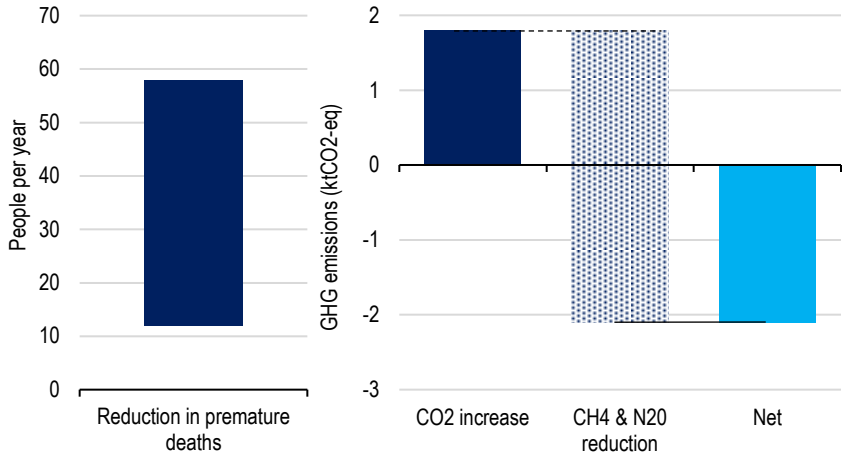
Figure 90: Global IT investment in Construction forecast to grow 19% CAGR between 2015 and 2025



Source: McKinsey, Nemetschek

- **Clean cooking:** Cooking activities are also a crucial factor in building energy efficiency, and closely linked to Sustainable Development Goals. Cooking accounts for 1 Gt CO_2-eq globally, and one-fifth of these emissions come from the inefficient combustion of wood or other fuels, which produces methane (CH4), nitrous oxide and black carbon, underlining the importance of electrification across developmental goals. Increasing access to clean cooking reduces emissions overall as increases in CO_2 emissions would be more than offset by lower methane and nitrous oxide emissions.
- It is equally important to note that household-related air pollution resulting from inefficient cooking is linked to c. 2.5mn premature deaths p.a. The IEA and IMF estimate that achieving universal access to clean cooking by 2030 could avoid around 1.9mn premature deaths p.a. Investing in clean cooking would also improve productivity in frontier and developing nations as it avoids up to 1.5 hours spent on average per day collecting fuel wood, and reduces the time spent cooking by four hours on average. These are burdens that fall disproportionally on women and therefore, clean cooking could be a major driver of female empowerment.

Figure 91: Investing in access to clean cooking solutions saves lives, increases productivity and reduces emissions.

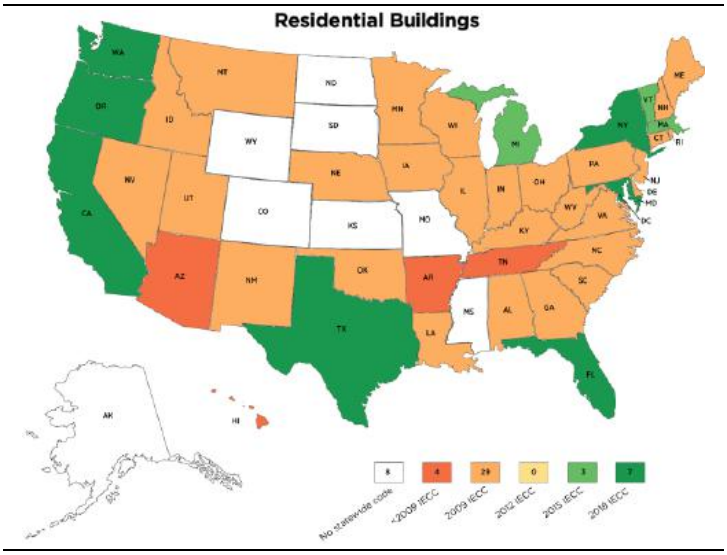


Source: IEA

Recent developments

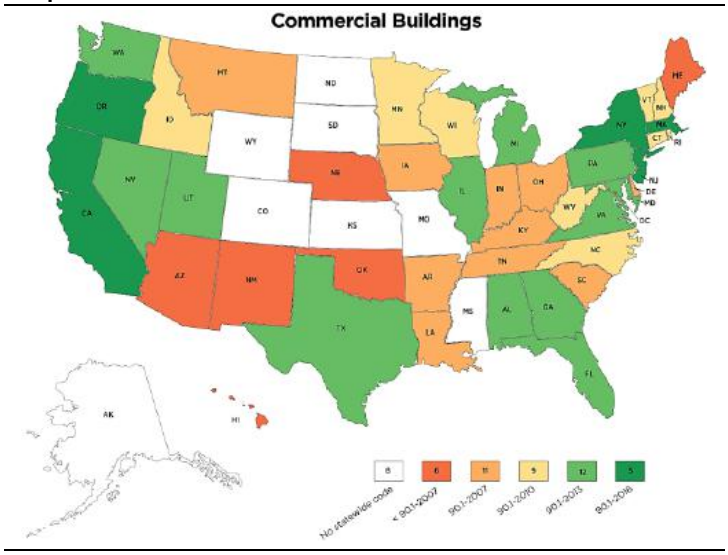
- **Energy efficiency codes:** Credit Suisse's US Building Products sector team has found that Installed Building Products (IBP) and TopBuild (BLD) have high exposure to single-family new residential construction, solid pricing power due to labour tightness, benefits from mix shift to single-family from multi-family, increasing energy efficiency codes.
- **US 2021 Building Energy Efficiency Code**: Building energy codes have become more stringent over time. The 2021 Building Energy Efficiency Code was passed in April and will be published in the fall, after which states and cities can choose to adopt it. Every three years the International Energy Conservation Code, which establishes the minimum energy efficiency of America's new buildings, is reviewed and updated. Currently, more than 40 states use the code, though not all use the latest version. The 2021 code is posed to generate significant efficiency gains for new commercial buildings and renovations. The following is a breakdown of which version of the IECC code each state has currently adopted, with dark green representing the most recent (2018), red representing the oldest (2009 and earlier), and white representing no statewide code adoption.

Figure 92: Residential building energy efficiency code adoption



Source: International Energy Conservation Code

Figure 93: Commercial building energy efficiency code adoption



Source: International Energy Conservation Code

- **Renovation wave in Europe:** One core element of the EU's recovery strategy tied to Transition is the 'renovation wave', with the intention to double the annual renovation rate of existing stock. This includes measures to target better energy efficiency in buildings and improving their energy performance, and designing buildings in keeping with a 'circular economy'. Considering academic findings on the benefits of green construction projects based on assessments of implemented policies following the GFC (delivers higher economic multipliers, high short-term job creation, less susceptible to offshoring to imports, etc.), such policy is well chosen to deliver not only economic recovery but also support for the Green Agenda (CS European Energy sector).
- **Energy efficient codes being adopted in the US:** Our US Building Products sector team has found that insulation is a major part of the building envelope and is one area in which US states are starting to mandate stricter and more energy efficient measures, and energy efficiency code adoption is still in the early phases. There are many ways to increase energy efficiency for residential and commercial buildings (HVAC system, smart thermostat, solar, lighting, etc.). Looking forward, while there has been meaningful progress made in lowering energy usage through continued updates to the IECC (International Energy Conservation Code) every few years, the adoption by states across the US has been slow. Some states such as California, Oregon, Washington, and Massachusetts have been more aggressive with energy code adoption, but the majority of the US has a long way to go. (Seven states have no statewide codes.)
- **Cash rebate to improve energy efficiency in South Korea:** Sale of home appliance looks to be strong on both the pent-up demand and cash rebates offered by the South Korean government, according to our Korean Consumer Sector team. As per the government initiatives to improve efficiency in power consumption, consumers are offered 10% cash rebates on purchase of energy-efficient home appliances, from 23 Mar~31 Dec 2020. Cash rebate on purchase of home appliances was offered since last year but this year's benefit increased to ten product categories (from seven last year). The rebate of 10% of purchase price was maintained, while the amount was raised to W300k (from previous W200k) per person. The government has increased the related budget to W150bn from W30bn last year.

Beneficiaries of green stimulus

Examples of beneficiaries from the theme of energy efficiency in buildings are relatively broad and include companies with exposure to: building materials; home renovation/DIY; insulation materials and tech; industrial automation and energy management services; efficiency home appliances; HVAC; efficient lighting (LEDs); smart energy / grid management; and window insulation.

Figure 94: Key global CS Neutral or Outperform rated exposures to Energy Efficiency – Buildings

Company	TP	CS TP Upside	CS Rating	MC (US$ bn)	P/E		Sales	Earnings	Quality	Momentum	Business Sustainability	Holt E-Cap Award	Refinitiv ESG Momentum
					12MF	12MF/5Yr median	Consensus '20-22' CAGR		Percentile rank				
Siemens	€145	22.22%	O	119.3	18.0	31%	4%	19%	54	74	56	✓	0.1%
Honeywell International Inc.	US$170	3.3%	O	115.5	21.9	21%	5%	11%	67	40	54	✓	9.9%
Schneider Electric	€111	4.96%	O	69.4	22.9	48%	6%	20%	62	44	60	✓	1.0%
Gree Electric	Rmb64	17.89%	N	47.3	13.1	27%	12%	17%	80	27	62	✓	-34.4%
Philips	€41	-5.05%	N	45.5	21.1	14%	5%	16%	64	63	54		-1.3%
Kone Corporation	€71	-1.83%	O	41.8	37.6	63%	5%	11%	94	84	55		2.7%
Emerson Electric	US$77	10.35%	O	41.7	20.5	7%	3%	9%	80	77	52	✓	2.4%
Johnson Controls Inc	US$44	6.80%	O	31.5	17.0	10%	4%	15%	69	75	44	✓	-4.9%
Trane Technologies	US$117	-1.23%	O	28.4	27.2	61%	na	na	75	87	57	✓	10.6%
Schindler-Holding AG	SFr225	-5.30%	O	28.1	30.8	28%	5%	16%	69	33	61	✓	10.0%
STMicroelectronics NV	€30	18.44%	O	27.3	24.0	31%	11%	44%	20	83	62		3.7%
Haier Smart Home	Rmb16	-29.86%	N	21.2	17.7	58%	9%	17%	54	64	50	✓	na
Geberit	SFr450	-13.69%	N	20.4	30.9	27%	4%	7%	80	71	64	✓	4.3%
Maxim Integrated Products	US$74	4.49%	N	18.9	27.6	36%	6%	10%	71	87	63		3.2%
Halma	p2530	13.00%	O	11.2	39.9	51%	6%	9%	81	31	64	✓	4.6%
Lennox International	US$257	-9.51%	N	10.9	29.3	44%	6%	13%	83	79	53	✓	2.0%
James Hardie Industries plc	A$35	9.78%	O	10.1	25.2	16%	10%	14%	65	90	41		0.7%
Owens Corning	US$66	-4.24%	N	7.4	15.7	12%	4%	21%	56	86	54		0.0%
Electrolux	Skr215	15.13%	O	6.1	17.3	27%	4%	49%	33	84	48		9.4%
Ambuja Cements	Rs250	12.31%	O	5.9	20.7	-6%	12%	11%	27	80	65		0.0%
Havells India Ltd	Rs540	-18.65%	N	5.6	58.1	47%	14%	26%	79	24	51	✓	64.3%
TopBuild	US$176	13.95%	O	5.1	21.3	32%	7%	17%	81	96	48		42.2%
ams AG	SFr21	30.35%	O	4.9	19.8	28%	42%	92%	74	4	40		10.0%
Acuity Brands	US$123	11.66%	O	4.4	13.9	-13%	na	na	83	59	58	✓	38.8%
LG Innotek	W190000	27.09%	O	3.0	9.2	-25%	8%	15%	40	80	52		5.4%
IBP	US$111	25.44%	O	2.6	18.7	-1%	9%	18%	82	95	49	✓	19.9%
Epistar Corporation	NT$39	-2.50%	N	1.5	na	na	6%	na	17	44	40		16.5%
CSR	A$4	12.02%	N	1.3	15.8	30%	2%	5%	29	55	46		0.0%
Seoul Semiconductor Co Ltd	W17200	5.85%	N	0.8	20.3	-2%	6%	24%	15	63	53		0.0%

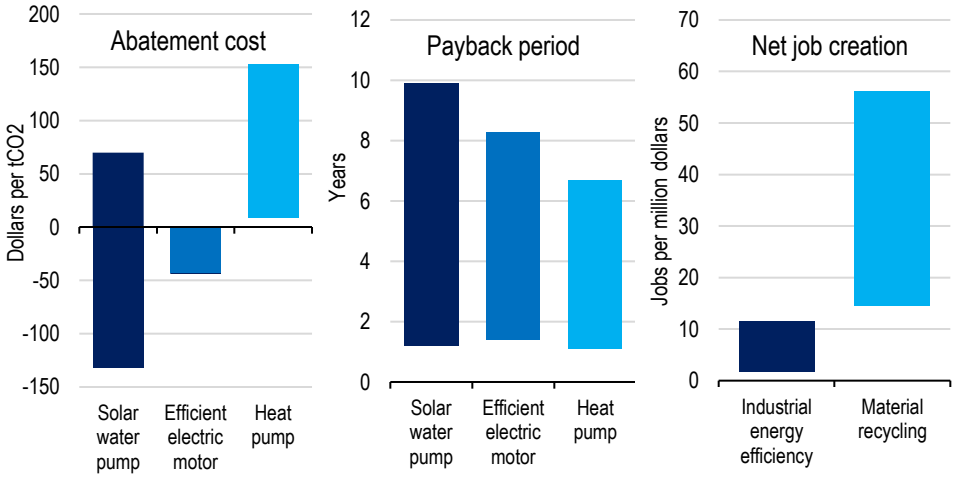
Source: Company data, Credit Suisse estimates

Industrials

The impact of COVID-19

The COVID-19 crisis has inevitably resulted in a severe slowdown in industrial activity. This is important as the industrial sector employs 23% of the global workforce and accounts for around 30% of final energy use (IMF, IEA).

Figure 95: Potential energy efficiency measures, payback periods and job creation

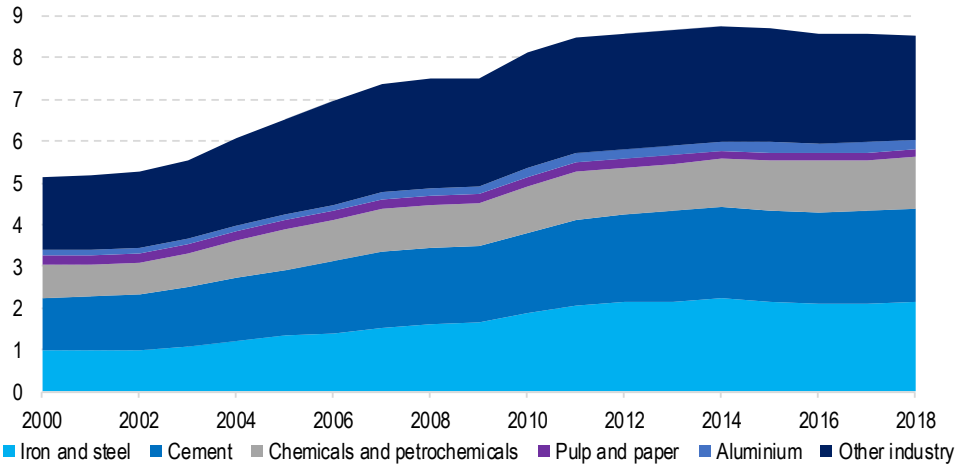


Source: IEA

Thematic drivers

- Industrial activities have been harder to decarbonise, and in 2018 still accounted for c. 37% of total global final energy consumption, with steady increases of 0.9% p.a. on average from 2010. Direct industrial CO_2 emissions, including process emissions, declined 0.6% to 8.5 $GtCO_2$ in 2018, which was 24% of global emissions. The case for energy efficiency is compelling: 80% of energy is lost through the value chain between the generation and gathering of energy sources and their eventual consumption in industry (ABB).
- We expect efficiency to be a long-term growth driver for the sector on the back of megatrends such as: EM growth in power, the increasing adoption of automation and robots, decoupling carbon from increasing production volumes, the interplay of industrials and ICT via IoT deployments and, in turn, smart grid and cities, and off-grid renewables integration.

Figure 96: Industry direct CO2 emissions, 2000-18 (Gt)



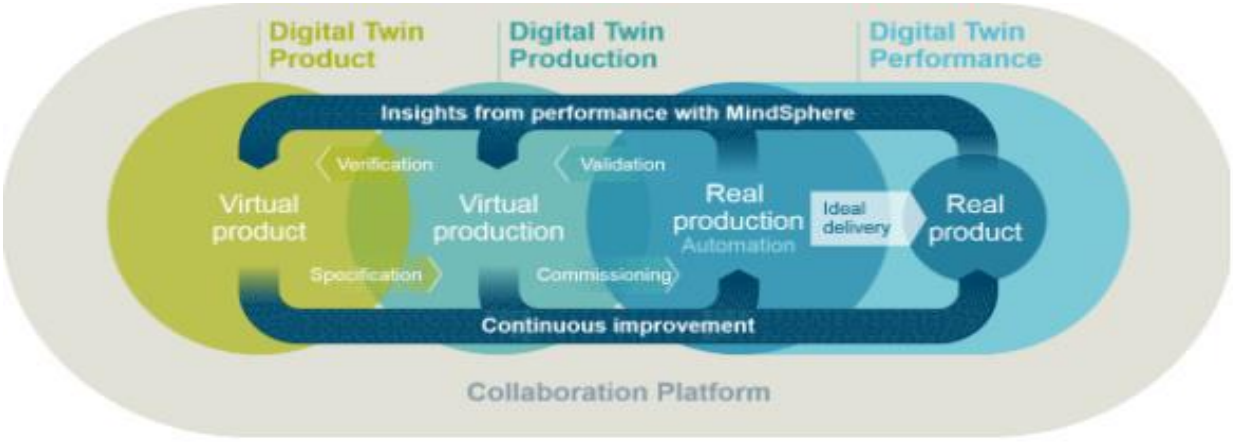
Source: IEA, Credit Suisse estimates

- **General efficiency measures through best practices and technology updates:** Industrial energy efficiency offers a convincing opportunity for government Green Stimulus, investment in currently available best practices and technologies could reduce energy consumptions and CO_2 emissions by c. 30% and provide significant cost savings. Payback periods are estimated at 3Ys in OECD countries and 5Ys in non-OECD countries (IEA).

Implementing cost-effective industrial efficiency technologies and solutions would reduce emissions in 2030 by c. 2 Gt CO_2 and would require around $50bn additional investment p.a. For example, the use of more efficient electric motors in industrial processes would provide around half of these savings and avoid more than 1,200 TWh of energy use in 2030.

- **Industrial Automation a current but also longer term driver of energy efficiency:** We think the adoption of Industrial Automation should help improve energy efficiency from the below perspectives:
  - Overall improvement in energy efficiency through improvement in production efficiency through adoption of automation content;
  - Adoption of digital tools and Industry 4.0 /IIoT implementation driving energy efficiency through processes optimisation based on data collected; and
  - Adoption of industrial software driving waste elimination and paving the foundation for further IIoT adoption.
- We highlight that the above logic also applies to the Building/Construction industry, where Building Automation also helps to improve the efficiency during construction. Remote monitoring also drives energy optimisation and therefore energy efficiency within buildings. Virtual production technology solutions will also be increasingly important as construction evolves to a more circular life cycle approach, e.g., moves toward modular construction which enables recovery.

Figure 97: Value chain of Industrial Automation—information flows between the virtual and the real world allow more detailed modelling and production and therefore precise implementation of production that helps to drive waste elimination and also improve efficiency



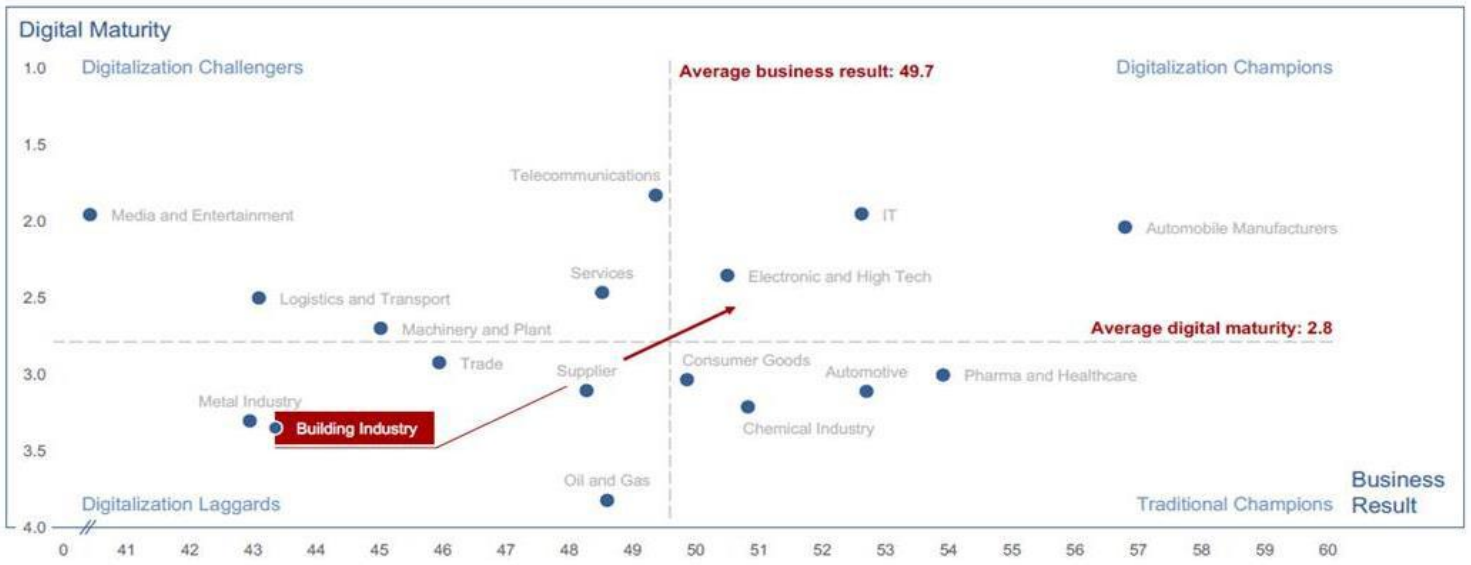
Source: Siemens

- **Real-life example: Schneider's smart factory in Le Vaudreuil—15% reduction in energy consumption.** Schneider has transformed its own factory in Le Vaudreuil, France, into a smart factory. The factory introduced digital tools to support its mass production operations. The production line has been 100% automated and, using augmented reality, technicians can now analyse data and address issues, making interventions safer and reducing diagnostic time by 30%. According to Schneider, the factory has seen a 15% reduction in energy consumption through Power, Automation and Software applications.
- **Substantial downtime reduction potential...** According to industry experts, using AI and ML, computer algorithms can identify anomalies and inefficiencies which humans alone could not pick up on, reducing machine downtime by 30-50%. Furthermore, AI can have multiple uses from identifying risks to optimising campaign use for customers.
- **...as well as productivity and lifetime improvements.** Overall equipment effectiveness can be improved when AI systems are able to identify potential problems with machines

before they break down. Predictive maintenance using data analytics has been found to increase productivity 18-30% and increase machine life time 20-40%.

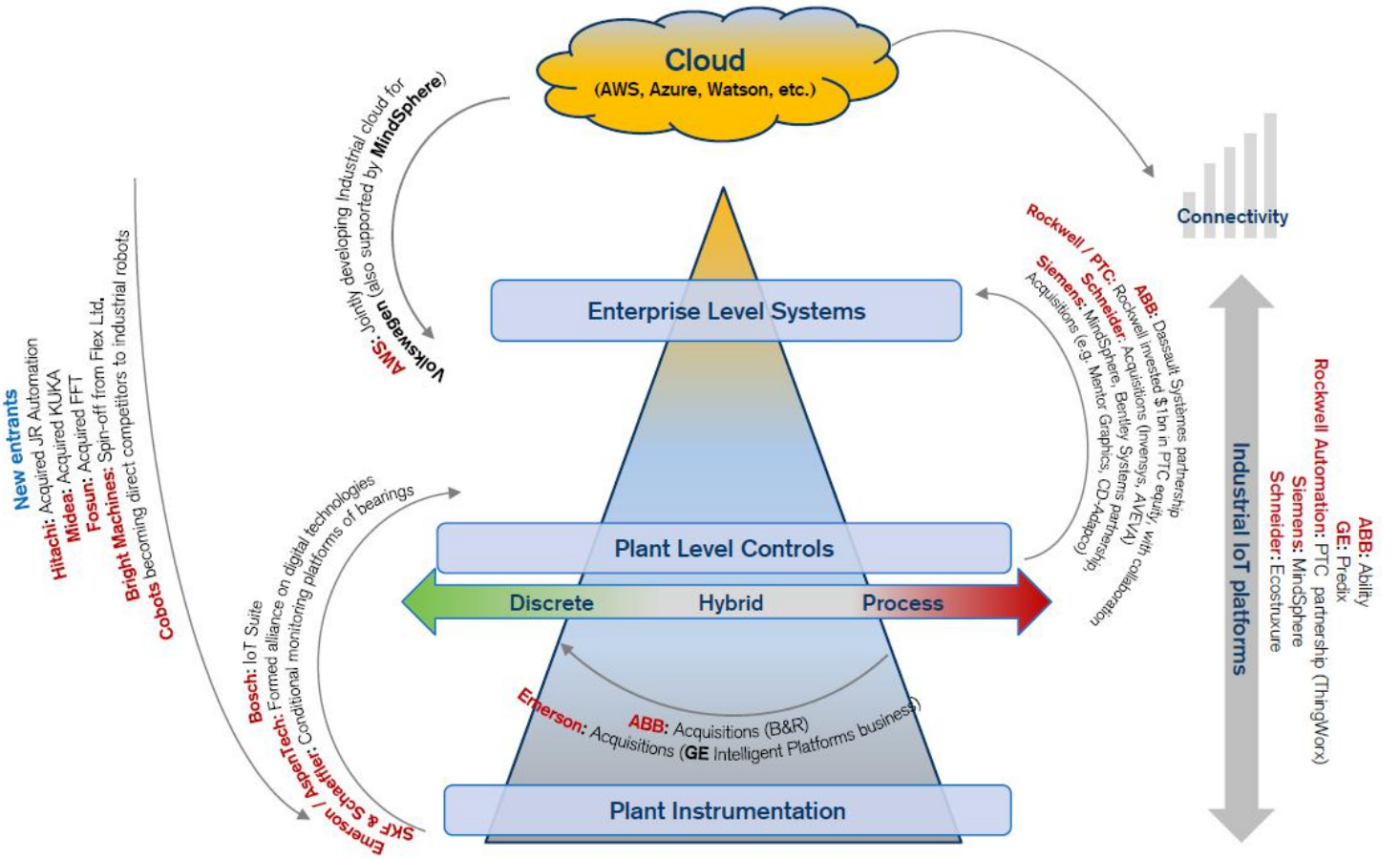
- **Digital focus is high for Industrials while penetration is still very low.** Even though 91% of European manufacturers are investing in digital factories, only 6% have digital factories in use. We can see that, whilst the resources are available, manufacturers are still yet to benefit from cost, and therefore energy, reductions through digitalisation.

Figure 98: Automotive manufacturing leads in digitalisation, with some industries lagging, suggesting room for improvement



Source: Accenture, Nemetschek

Figure 99: Industrial Automation—software is increasing featured in the Industrial Automation ecosystem


Cloud
(AWS, Azure, Watson, etc.)
AWS: jointly developing Industrial cloud for Volkswagen (also supported by MindSphere)
Connectivity
Enterprise Level Systems
Plant Level Controls
Discrete
Hybrid
Process
Plant Instrumentation
Industrial IoT platforms
New entrants
Hitachi: Acquired JR Automation
Midea: Acquired KUKA
Fosun: Acquired FFT
Bright Machines: Spin-off from Flex Ltd.
Cobots becoming direct competitors to industrial robots
Bosch: IoT Suite
Aspen tech: Formed alliance on digital technologies
Conditional monitoring platforms of bearings
Emerson / SKF & Schaeffler
Emerson: Acquisitions (GE Intelligent Platforms business)
ABB: Acquisitions (B&R)
Rockwell / PTC: ABB: Dassault Systèmes partnership
Schneider: Rockwell invested $1bn in PTC equity, with collaboration
Siemens: MindSphere, Bentley Systems partnership, Acquisitions (e.g. Mentor Graphics; CD-Adapco)
Acquisitions (Invensys, AVEVA)
Rockwell Automation: PTC partnership (ThingWorx)
Siemens: MindSphere
Schneider: Ecostruxure
ABB: Ability
GE: Predix

Source: Credit Suisse

Figure 100: Key players in Industrial Automation with relative areas of strength

		Software		Control systems (software& hardware)				Hardware		
		PLM	MES	HMI/ SCADA	PLC	DCS	CNC	Discrete	Process	Robotics
Europe	ABB		✓	✓	✓	★		★	✓	★
	Schneider	✓	✓	★		✓		★	✓	
	Siemens	★	✓	★	★	✓	★	★		
	Rotork								★	
	IMI								✓	
	Spectris			✓					✓	
	Kuka									★
US	Emerson				✓	✓		✓	★	
	Rockwell		✓	✓	★	✓				
	Eaton			✓	✓			✓		
	Honeywell		✓			★				
	GE		✓						✓	
	Pentair (sold to EMR)								★	
	Flowserve								★	
Japan	Fanuc						★			★
	Mitsubishi Electric				★			★		✓
	Yaskawa									★
	Yokogawa					★				
	Omron				★			✓		
China	Supcon		✓			✓				
	Hollysys					✓				
	Weinview			✓						
	Baosight		✓							

★ Indicates Industry Leaders

✓ Indicates a meaningful position (domestic top 5 for Chinese companies)

Note: We have excluded Chinese robotics players because they are outside of the domestic Top 5. Key players include Effort, GSK, Estun, Siasun and STEP.

Source: Credit Suisse

- **Industrial IoT.** In Industry 4.0, interactions between the virtual and physical systems are enabled by connected devices and internet-based information networks. Information flow is no longer one-dimensional but also includes bottom-up feedback from devices and communication between upstream and downstream workflow. It creates an integrated system from product design to production and warehouse solutions which is self-adapting to the changing demand environment. Our analysis shows that GE, Siemens and Schneider appear more advanced in IIoT than ABB. According to a new report by Ericsson, broader IoT applications could help reduce GHG emissions by up to 8 Gtonnes CO CO_2e or 12% of the global GHG emissions in 2030 in a high reduction potential scenario, and 4 Gtonnes CO_2e in 2030 or 6% in a medium reduction potential scenario. If the same efficiencies are extrapolated to application in Smart Agri. the total potential emission abatement could reach 10 Gtonnes CO_2e (15%).

Figure 101: Industrial IoT platform vendors

	Company	Applications	Launch date	Revenue	# of ...			Tech partners
					Industries	Staff	Countries	
IoT platforms	ABB	Ability	March 2017	Service and software revenue $6bn	20+	n/a	n/a	IBM Watson, Microsoft Azure
	GE	Predix	2013; August 2015 (launched cloud service)	$1bn+ Predix-powered revenue in 2017; $12bn digital revenue by 2020	n/a	35,000+ developers	n/a	Apple, IBM Watson, Microsoft Azure
	Honeywell	Sentience	12/16; Honeywell Forge expected Q219	$2.6B of Software Revenue (embedded and standalone)	HON-specific	2,000+ internal developers		n/a
	Rockwell	FactoryTalk InnovationSuite	2016 Connected Enterprise	$300mn in 2018 in Information Solutions and Connected Services	n/a	n/a		PTC, Microsoft, Cisco
	Schneider	EcoStruxure	2008; November 2016 (launched	Software revenue £650m in 2017 (£450m before AVEVA acquistition)	10+	9,000 system integrators	58	Microsoft Azure, Intel
	Siemens	MindSphere	Before 2011 (originated from Digital Factory); March 2016	Small relative to other digital revenues (Digital revenues €5.2bn, of which €4bn software and €1.2bn digital services)	20+	900 software developers	17	IBM Watson, Atos, Microsoft Azure, SAP, Accenture

Source: Credit Suisse

Recent developments

- **Efficient equipment and automation driving container equipment demand:** Our European Capital Goods sector team identified four major drivers of growth in demand for container equipment, two of which were increasing ship size driving the need for bigger and more efficient equipment, and growing interest in automation. Company announcements within the sector point to port capex postponements rather than full cancellations at this stage and a willingness to protect investments in digital, efficiency and automation.
- **Automated machinery can be run more efficiently**. Our European Capital Goods sector team found that power consumption is reduced as automated movements avoid sharp accelerations and boxes do not need to be lifted as high when automatically controlled as the machine operates with tighter tolerances than a human operator. These same factors reduce the effective utilisation rate and therefore cut down on wear and tear over a given period. In addition, excessive speed or fatigue are often factors in port accidents.

Beneficiaries of green stimulus

- **We highlight Schneider as a key beneficiary of ESG.** Schneider overall plays directly into the themes of (1) Energy Transformation/Electrification and (2) Industrial IoT/ Digitalisation across Energy Management and Industry Automation business with also an interesting overlap across the two. Schneider plays a dual role of a 'doctor and a pharmacist' to its customers—offering consulting and advice for energy consumption optimisation and general waste reduction but also offers a set of product and systems solutions together with software tools to implement it. Supply Chain: Schneider is now ranked No 4 globally outright

across all companies (industrial and outside) by Gartner for its supply chain excellence (from No 11 in 2019). Schneider also features 7% of sales in Software (including the recently announced acquisition of OSIsoft) and further 10% in Services, and is strategically well-positioned considering the increasingly important role software plays in both the Industrial Automation and Energy Management space.

Figure 102: Key global CS Neutral or Outperform rated stock exposures to energy efficiency—industrials

Company	TP	CS TP Upside	CS Rating	MC (US$ bn)	P/E		Sales	Earnings	Quality	Momentum	Business Sustainability	Holt E-Cap Award	Refinitiv ESG Momentum
					12MF	12MF/5Y median	Consensus '20-22' CAGR		Percentile rank				
Cisco Systems	US$45	7.24%	N	177.2	13.4	-3%	2%	4%	83	27	64	✓	1.4%
Siemens	€145	22.22%	O	119.3	18.0	31%	4%	19%	54	74	56	✓	0.1%
Schneider Electric	€111	4.96%	O	69.4	22.9	48%	6%	20%	62	44	60	✓	1.0%
ABB	na	na	NR	56.2	24.7	44%	5%	27%	52	84	48	□	4.0%
Emerson Electric	US$77	10.35%	O	41.7	20.5	7%	3%	9%	80	77	52	✓	2.4%
Sika	SFr240	12.78%	O	33.3	36.8	55%	7%	21%	66	57	54	✓	19.8%
Rockwell Automation	US$226	-2.10%	N	26.8	29.1	46%	6%	12%	71	83	61	✓	31.2%
Ferguson PLC	p6181	-17.17%	N	22.0	21.4	45%	3%	6%	74	76	61	✓	-96.4%
Delta Electronics	NT$216	9.64%	O	17.4	18.4	6%	9%	18%	55	89	60	✓	-2.2%
Ingersoll-Rand Inc.	US$33	-6.36%	N	14.7	23.7	34%	8%	25%	91	83	53	□	34.9%
Halma	p2530	13.00%	O	11.2	39.9	51%	6%	9%	81	31	64	✓	4.6%
Alfa Laval	Skr213	-5.04%	N	10.7	20.1	9%	0%	4%	78	84	55	✓	8.0%
Woodward Inc	US$90	7.75%	O	5.2	25.4	33%	3%	11%	58	57	47	□	-3.4%
Airtac	NT$655	-2.53%	O	4.4	29.3	43%	15%	18%	58	90	49	□	66.1%
Rexnord Corporation	US$32	8.22%	N	3.6	16.1	11%	5%	15%	84	78	58	✓	118.1%
Hiwin	NT$320	-1.72%	N	3.5	33.4	56%	18%	45%	37	53	48	□	161.5%
Hexcel Corporation	US$47	16.63%	O	3.4	31.5	66%	7%	49%	53	8	48	✓	23.1%
Chroma	NT$206	25.61%	O	2.3	19.3	8%	10%	19%	56	37	59	□	21.3%

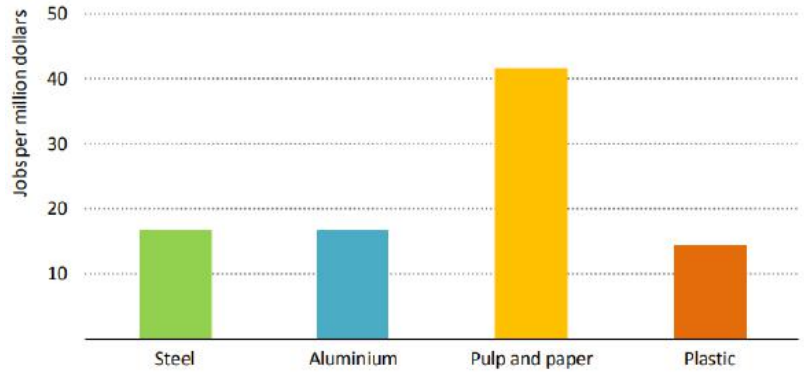
Source: Company data, Credit Suisse estimates

Circular economy

The impact of COVID-19

COVID-19 lockdowns have led to the temporary closure of waste and recycling operations in many countries. Moreover, the halt in construction activity has affected general waste and scrap availability for secondary metal production and resource recovery. A secondary economic impact has been the decline in oil prices, disrupting the plastic recycling industry by a reduction in the value of recycled products. According to IMF and IEA estimates, for spending measures, recycling and biofuels have the highest multipliers because of the labour intensity of processing feedstocks. Waste and material recycling has large job creation potential, especially in developing countries, where establishing recycling industries creates around 15-40 jobs per US$1mn investment. Finally, we have also seen delays to bans on single-use plastics, due to hygiene and contamination concerns that reusable plastics could spread the virus, and there has been a slowdown in recycling activity.

Figure 103: Net job creation of recycling per million dollars of spending



Source: IEA

Circular economy stimulus policies

The circular economy is also split into two sub-themes although there are only three policies which include the EU's circular economy initiative (US$11.80bn), Denmark's policy to assist companies in going circular (US$0.01bn) and the UK's drive to reuse waste ash and develop recyclable steel (US$0.21bn).

- The concept of a circular economy to replace a traditional linear economy was growing in popularity prior to the pandemic. Since the China National Sword policy, we have seen many nations ban the export of certain waste streams, along with bans on the manufacture of certain single-use plastic products (such as plastic bags and single-use plastic containers) and stimulus to support domestic recycling. In an attempt to stimulate demand for recycled plastic, the EU has announced a €0.80/kg tax on plastic packaging waste that is not recycled. The policy was agreed by member states in July, giving the EU an additional €8.24bn per year (10.3mn tonnes of non-recycled plastic packaging waste in 2018 x 0.8 Euro/kilogram) to aid their green recovery efforts. The UK announced a similar policy that will see companies paying £200 per tonne of packaging made from less than 30% recycled plastic from April 2022.
- In August 2019, the Australian federal government announced a ban on low grade waste exports from 2021, and subsequently A$600mn in funding (including co-investment from industry and state governments) for waste management and recycling infrastructure and to support the recovery of recycled plastic and paper/pulp. The government has also announced targets, including making 100% of all packaging reusable, recyclable or compostable by 2025; 70% of plastic packaging recycled or composted by 2025; 30% average recycled content across all packaging by 2025 (including government procurement).

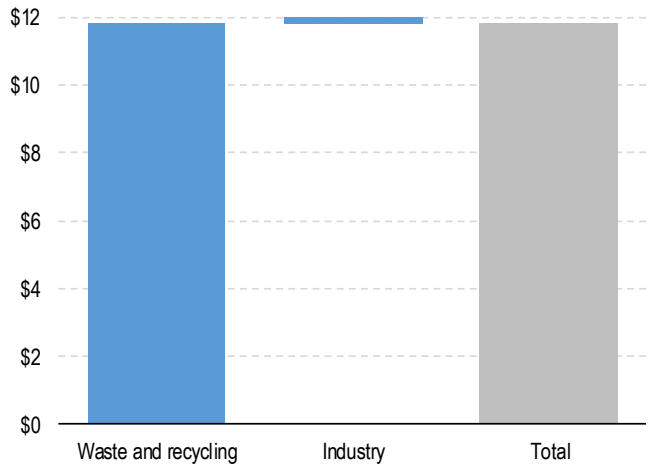
Recycling industry body, ACOR, estimated that 1.4mn tonnes of waste would no longer be able to be exported under the government's waste export ban and would need recycling domestically. In relation to plastic, the Recycling Market Situation Summary Review predicts that Australian recycling will need to increase recycled plastic processing by 400% to process the stranded waste from China National Sword and to meet the 70% plastic recycling target by 2025.

- Since the pandemic, the EU has launched a new natural capital and circular-economy initiative under InvestEU that would mobilise at least €10bn over the next ten years toward circular economy efforts. The UK and Denmark have announced policies assisting industry to meet circular and green targets, including, in the case of the UK, reusing waste ash in the glass and ceramics industry, and developing recyclable steel.

Figure 104: Circular economy stimulus by country (US$bn)

Source: Credit Suisse estimates

Figure 105: Circular economy stimulus by sub-theme (US$bn)



Source: Credit Suisse estimates

Thematic drivers

The concept of the circular economy relates to a model whereby the traditional 'take, use and dispose' approach is replaced by a 're-use or recycle' approach. Such a shift would have multiple benefits from an impact perspective, such as reduced energy consumption as production needs reduce, and waste reduction. The reason the circular economy is a key component of meeting long-term climate change targets is that the energy transition and energy efficiency measures are unlikely to address all emissions. Research from the Ellen Macarthur Foundation suggests that almost half of the remaining emissions generated by cement, aluminium, plastic and food production can be eliminated by applying circular-economy strategies. The circular economy theme touches on many different sectors and sub-themes. In this section we focus on one aspect of the circular economy: plastic.

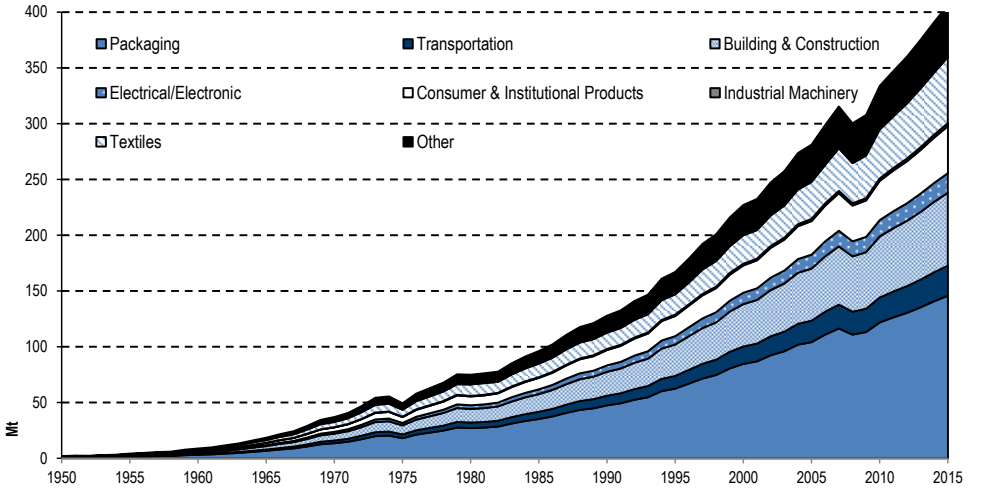
While we predominantly focus on the opportunity in the transition towards a circular economy in packaging and plastics, circular economy opportunities exist across several materials through resource recovery. Increasing global average recycling rates (for all materials) from around 41% today to 47% in 2030 would reduce emissions from material production by around 20% from today (IEA). Growth in recycling would be likely to come primarily from plastics and steel, where current rates are lower than for paper and aluminium.

The ubiquitous rise of plastics

Half of the plastics ever produced were made in the past 13 years, making plastic the most prolific material on the planet (Geyer, Jambeck and Law, 2017). Global production of resins and fibres increased from 2mn tonnes in 1950 to 380mn tonnes in 2015, a CAGR of 8.4%, c. 2.5 times the CAGR of the global GDP over the same period (PlasticsEurope). Experts estimate

that, on its current business-as-usual trajectory, production will increase by a further 40% over the next decade. The dominant story of plastic is the inexorable rise in plastic packaging, now at 40% of global plastic use, accelerated by the shift from reusable to single-use functions. Plastic as a material for packaging has had significant advantages: allowing products to be marketed effectively, improve branding through flexible design, reduced product waste and carbon emissions, and efficient transport of goods throughout the world. For this reason, the production growth of plastics has been faster than that of any other group of bulk materials including cement, aluminium, steel and ammonia (IEA).

Figure 106: Annual production of primary plastics by sector (million tonnes)

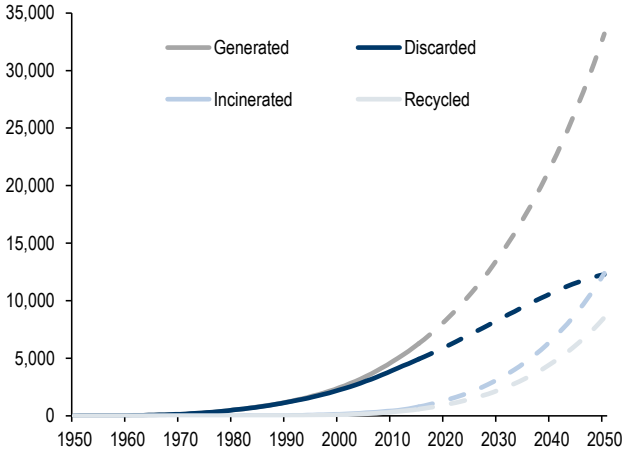


Source: Geyer et al, 2017

In 2016, the World Economic Forum (WEF) estimated that 95% of plastic packaging material value, estimated at US$80–120bn, is lost annually to the economy after a short first use, based on the then rate of 14% of plastic packaging being collected for recycling. As of 2015, approximately 6,300mt of total (accumulated) plastic waste had been generated, of which only 9% had been recycled, 12% was incinerated, and 79% was accumulated in landfills or the natural environment (Geyer et al, 2017).

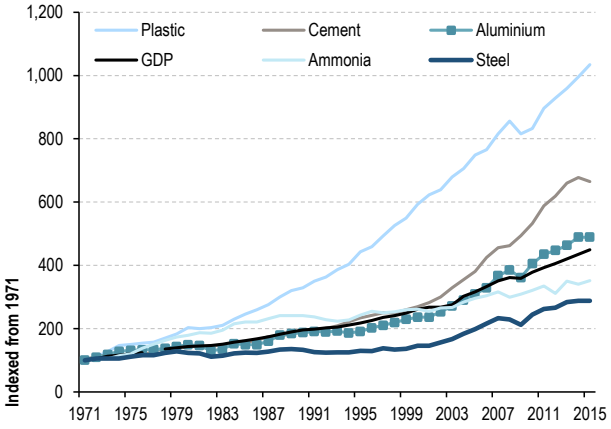
Designed to be indestructible yet generally used only once, plastic packaging has become one of the environmental challenges of our age. None of the commonly used plastics are biodegradable; they accumulate in landfills or the natural environment rather than decomposing. Near-permanent contamination of the natural environment with plastic waste is a pervasive outcome. The equivalent 'natural capital' cost of plastic packaging is estimated at US$40bn, exceeding the total profit pool of the entire global plastic packaging industry.

Figure 107: Projected increase in total (accumulated) plastic waste generation and recovery by 2050 (million tonnes)



Source: Geyer et al, 2017, Credit Suisse research

Figure 108: Production growth of plastic vs other bulk materials and global GDP



Source: IEA, Credit Suisse research

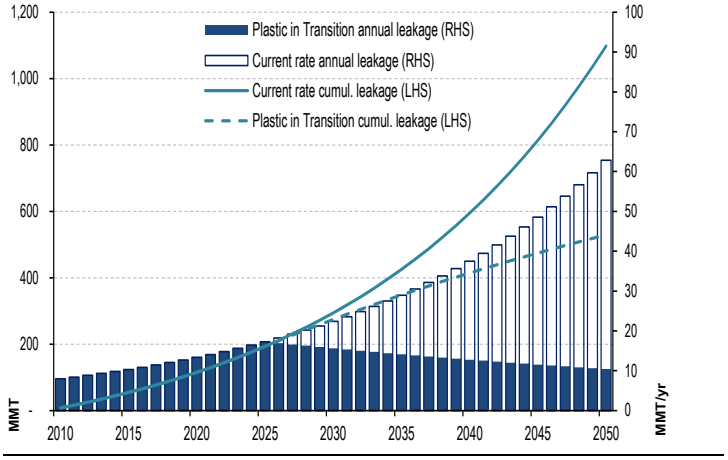
Plastics also use c.14% by mass of all oil extracted as a raw material feedstock and in the plastic manufacturing process. This is more than the oil consumption of the global aviation sector; we expect the use of oil by the plastics industry to increase much faster than overall demand for oil. If the trajectory is sustained, the plastics industry will account for over one-third of the global growth in oil demand to 2030, and nearly half to 2050.

We estimate ocean pollution to grow until 2025

In our most recent Age of Plastic report, *APAC Value Chain*, we developed a comprehensive forecast of the current and projected rates of global ocean pollution. Given the lead time to developing waste-management infrastructure and that most government and company commitments will not be substantially complete for another six years, we find a worrying increase in marine leakage.

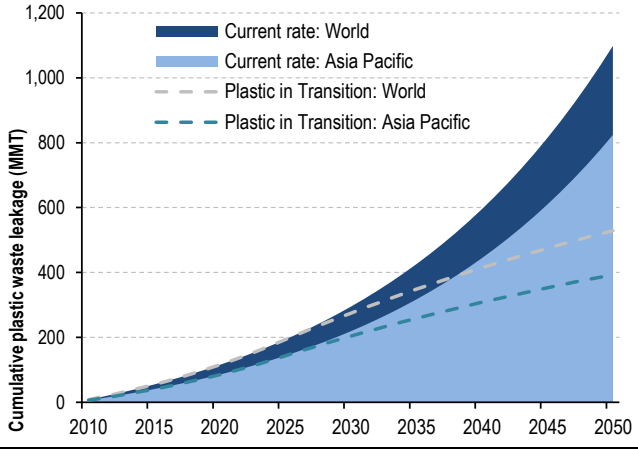
In line with the current rate, ocean pollution increases until at least 2025, reaching a cumulative 193MMT total globally, of which 143MMT is in Asia Pacific. As part of our forecasting, we also apply a Plastics-in-Transition scenario, which factors in an accelerated policy and consumer response, in which the whole value chain of plastic packaging transitions in an accelerated fashion. Under this scenario we find a 2% reduction in ocean pollution from 2025. The difference would ultimately be substantial at a notional plastic waste saving of 570MMT by 2050 in total globally or 50MMT annually.

Figure 109: Current estimated rate of leakage vs the 'Plastic in Transition' scenario


Plastic in Transition annual leakage (RHS)
Current rate annual leakage (RHS)
Current rate cumul. leakage (LHS)
Plastic in Transition cumul. leakage (LHS)
MMT
MMT/yr

Source: Jambeck et al 2014, Credit Suisse estimates

Figure 110: Asia is responsible for the majority of marine leakage


Current rate: World
Current rate: Asia Pacific
Plastic in Transition: World
Plastic in Transition: Asia Pacific
Cumulative plastic waste leakage (MMT)

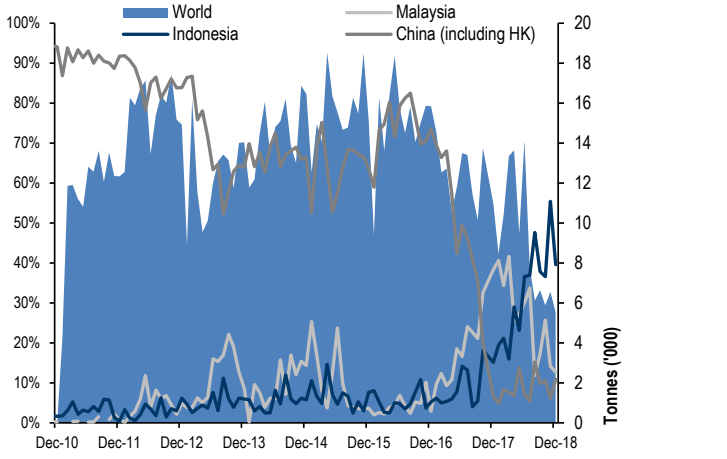
Source: Jambeck et al 2014, Credit Suisse estimates

Contrary to prior estimates, the most recent data indicates that less than 20% of plastic marine leakage originates from ocean-based sources like fishing vessels (McKinsey). This means that over 80% of ocean plastic comes from land-based sources, predominantly packaging. Our estimates show that over half of land-based plastic-waste leakage originates in just five countries: China, Indonesia, the Philippines, Thailand and Vietnam (in descending order of volume). However, it is important to note that this conceals the current reality that much of that plastic waste is sorted in high-income OECD countries and exported to Asia Pacific.

Stranded plastic waste, the reality of a post-exports world

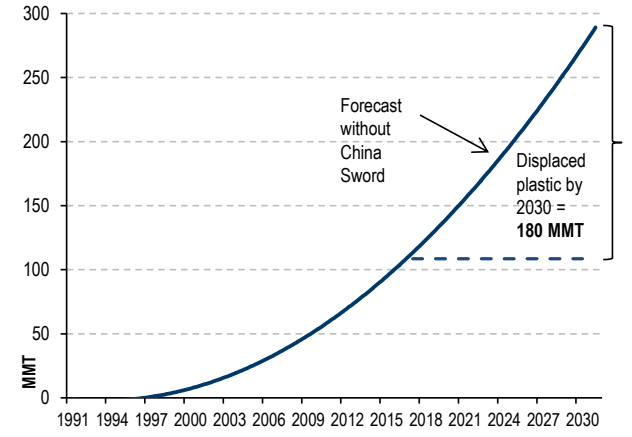
For decades, higher-income countries in the OECD have been exporting plastic waste (70% in 2016) to countries in East Asia and the Pacific with nascent waste management infrastructure. To further assess the historical reliance on plastic waste exports to China, using UN Comtrade data, we assess the rate of total plastic waste that would have been destined for China prior to the National Sword policy, and find a worse-than-expected trend. Extrapolating the historical trend, we forecast the total cumulative weight of 'stranded' plastic waste imports that will either have to be processed domestically or will now be exported to other countries with nascent waste management infrastructure as 180 MMT by 2030.

Figure 111: Australian plastic waste exports example—China drops from 2017



Source: Comtrade data of commodity 3915 imports to China, Credit Suisse estimates

Figure 112: Estimated global displaced plastic waste after the China import restrictions—a 180MMT plastic waste problem



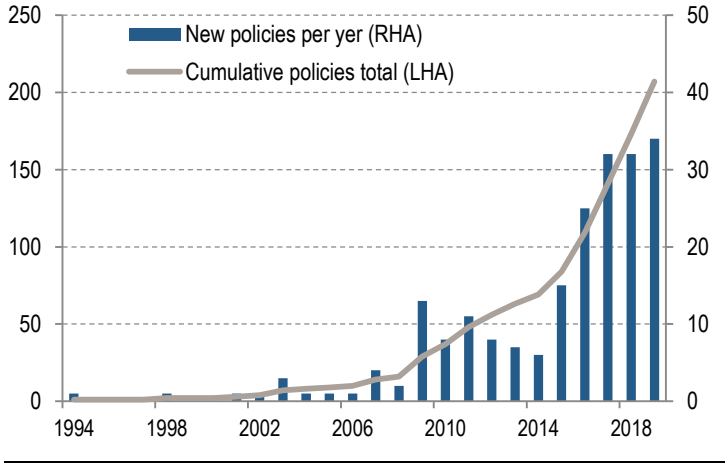
Source: Comtrade data of commodity 3915 imports to China, Credit Suisse estimates

Initially in response to the China Sword policy, Indonesia, Malaysia, Thailand and Vietnam attempted to pick up the slack. However, the waste-management infrastructure in these

countries is less developed. Consequently, more governments in Southeast Asia have subsequently introduced import restrictions and bans.

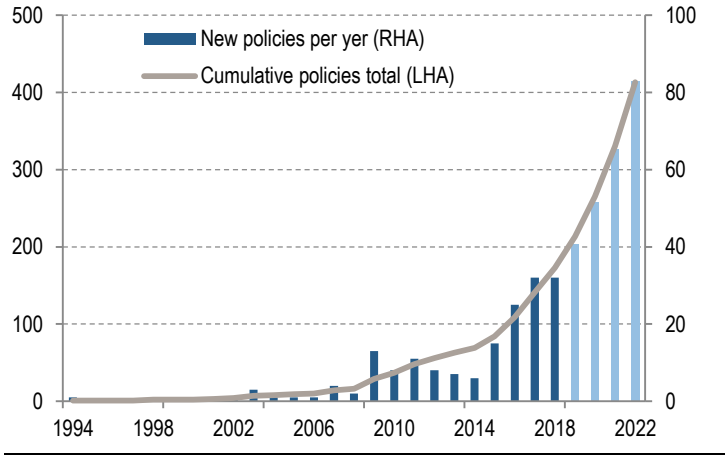
As part of the report series *The Age of Plastic,* Credit Suisse's ESG team has developed a Plastic Policy Monitor, tracking the introduction of policies by governments, states and municipalities globally. Using this tool, we have identified 34 new policies regulating the use and distribution of single-use plastic in 2019 YTD. In Asia Pacific, 24 countries have either banned a type of single-use plastic or put a levy on its use at a national level.

Figure 113: The number of single-use plastic policies has risen significantly since the 2008…



Source: Credit Suisse

Figure 114: …and the historical CAGR implies continued policy momentum



Source: Credit Suisse

Recent developments

- **EU investing in the circular economy:** InvestEU will also be equipped with a further €15.3bn from Next Generation EU for 'investing in the EU economic recovery'. However, it was noted in remarks from Frans Timmermans that under InvestEU, a new initiative for €10bn investment over the next decade aimed at natural capital and circular economy measures would be established.

- **EU plastic waste tax:** The EU has agreed to a levy a tax on non-recycled plastic waste at €0.80/kg from 2021 to support the green recovery. The tax was proposed in February and then agreed on 21 July. The proposed mechanism will be through a 'national contribution [to the EU budget] calculated on the weight of non-recycled plastic packaging waste' from the Member States to the EU. Member States could consider funding this contribution with country-level plastic tax and producer liability schemes, although these have not yet been announced.

- **Shipbuilders to focus on the circular economy:** In early June ENI announced in an MoU with Italian shipbuilder Fincantieri to extend the initial R&D cooperation set out in 2017, according to our European Energy sector analysts. This will focus on evaluating projects related to decarbonisation and the circular economy, in particular waste-to-energy, fuel cells, clean energy transport (natural gas, methanol, and hydrogen) and offshore renewable technologies.

- **Circular materials in Europe:** The European Commission is intending to double renovation rates from the 0.6-1.2% observed across the continent as part of a "Renovation Wave", with funding from the central €560bn Recovery and Resilience Facility available for this purpose, according to our European Chemicals team. The scheme enabling funding for Insulation, SolarPV installation, Efficient/renewable heating and cooling systems and use of circular materials, with public sector buildings (schools, hospitals) and social housing initially targeted.

- **EU Green New Deal—circular economy**: The Green New Deal has a Circular Economy Action Plan which was adopted on 11 March 2020. See below for key measures according to the Action Plan:
  - **E-waste:** Products placed on the EU market will be designed to last longer, to be easier to repair and upgrade, recycle and reuse. Providing incentives for product-as-a-service. Companies will keep the ownership and responsibility for the product throughout its lifecycle.
  - **Textiles:** Driving new business models will boost sorting, reuse and recycling of textiles, and allow consumers to choose sustainable textiles. Ecodesign will apply to a broader range of products: clothes will be made to last longer.
  - **Plastic:** Single-use products will be phased out wherever possible and replaced by durable products for multiple use. Acting on microplastic—restricting intentionally added microplastics, increasing the capture of microplastics at all relevant stages of the product lifecycle.
  - **Packaging:** New legislative initiatives on reuse to substitute single-use packaging, tableware and cutlery by reusable products in food services, as well as targets for reducing packaging waste will be proposed.
  - **Waste:** Measures will be introduced for waste prevention and reduction, increasing recycled content, minimising waste exports outside EU. An EU model for separate collection and labelling of products will be launched.

Beneficiaries of green stimulus

Reduce: while packaging at risk of demand destruction, solution providers will also benefit

Reduction is at the top of the waste hierarchy pyramid of 'reduce, reuse, recycle', and although challenging in some circumstances, it remains a key theme in the plastics transition. Reduction represents direct demand destruction for petrochemical companies and packaging companies, but also represents opportunities for first movers to find solutions including miniaturisation, light-weight material, reusable/refillable containers and other packaging solutions.

Key sub-themes:

- **Miniaturisation solutions:** There is increasing demand to enable light-weighting through the enhancement of key consumer goods' materials and ingredients. Biotechnology companies are increasingly seeking to develop solutions that modify enzymes, micro-organisms and biopharmaceutical ingredients to enable more concentrated liquids/solutions in home products, thereby reducing the size of packaging required.
- **Light-weighting solutions:** As well as providing the optimum packaging for miniaturisation products, packaging companies are at the forefront of designing plastic packaging applications that combine requisite material strength with lower amounts of material and weight.
- **Re-usable/refillable:** FMCG producers and retailers are beginning to move into reusable and refillable packaging. These solutions generally lower the cost of goods sold for major FMCGs, all else being equal. Other benefits included the associated brand loyalty from the consumer 'lock-in' to refillable applications.
- **Packaging innovation:** FMCGs have developed new packaging to minimise plastic use and increase recyclability or compostability. PepsiCo (PEP.OQ) announced a new target to reduce 35% of virgin plastic content across its beverage portfolio by 2025; Unilever announced the the first wrapper-less ice-cream pack with 35% less plastic compared with the original; and BASF has developed a certified compostable food-grade plastic.

Recover: the winners from the plastic transition

Growth in recycling would be likely to come primarily from plastics and steel, where current rates are lower than for paper and aluminium. Recycling reduces landfill disposal and incineration, and the costs associated with landfills. Today, 37% of global waste goes to landfills and the open burning of waste is associated with significant negative health impacts.

- **Mechanical recycling:** There have been moves to invest in recycling infrastructure globally as a means to secure supply of R-PET and to achieve resource-recovery targets announced by governments and companies. Some examples of this include a partnership between Veolia and Nestlé to work on waste collection and sorting and recycling plastic material (including pyrolysis) and a JV between Marel and Tomra to bring new sensor sorting and processing tech to the global poultry, meat and fish industry.
- **Chemical recycling:** The majority of plastics/polyester fibres are not recycled because existing technologies cannot process the impurities and dyes contained in various plastic packaging and polyester fibres. Chemical recycling seeks to resolve this issue through the process of depolymerisation, returning source monomers back into the feedstock supply.
- **Resource-recovery technologies:** Outside of mechanical and chemical recycling, there is an opportunity to improve sorting technology to provide high-purity mono-material that can be reprocessed and manufactured. The two main technological developments in sorting include optical sorting and image recognition that can be used to recognise specific packaging items. Resource recovery can also come in the form of extracting electricity or fuel from used material. The three key areas of this include energy from waste (EfW), landfill gas capture and processed engineered fuel (PEF).
- **Demand for recycled plastics:** Brands, retailers and manufacturers are driving demand for recycled plastics with aggressive commitments, including to ensure that all plastic packaging is reusable, recyclable or compostable by 2025 and to increase recycled content in packaging to an average of 25% by 2025, compared with the current global average of just 2%. Under the New Plastics Economy Global Commitment, FMCG producers, representing 20% of global PET demand, are switching to 30% or more recycled PET in packaging (*New Plastics Economy,* June 2019 report). This embeds demand and pricing support for recovered waste commodities for waste management companies.

  Pricing is already reflecting the reality of growing demand versus supply. Historically, when a price arbitrage between recycled PET (R-PET) and virgin PET opens up, demand for R-PET declines as the economic incentive to switch back outweighs the green credentials. However, through 2019 an inflection point for R-PET manifested, with prices strong despite sizeable declines in virgin spot prices.

Replace: who are the outright disruptors?

The third key theme is replacement, involving alternative plastics and packaging substrate switching. The challenges associated with recycling and recovering much of the plastic packaging in use globally, along with the attendant consumer backlash against plastic packaging, have fired the starting gun on a period of intense competition and innovation among packaging substrates. In our view, we are moving into one of the most intensely competitive periods for packaging companies in decades, as new-substrate disruptors seek to take market share from plastic and legacy plastic packaging products seek to adjust their offering to maintain their competitive position. Consumer pressure and aggressive targets by FMCG producers have resulted in growth in aluminium, cardboard and glass after years of low growth, along with growth in new materials including bioplastic and sustainable feedstock.

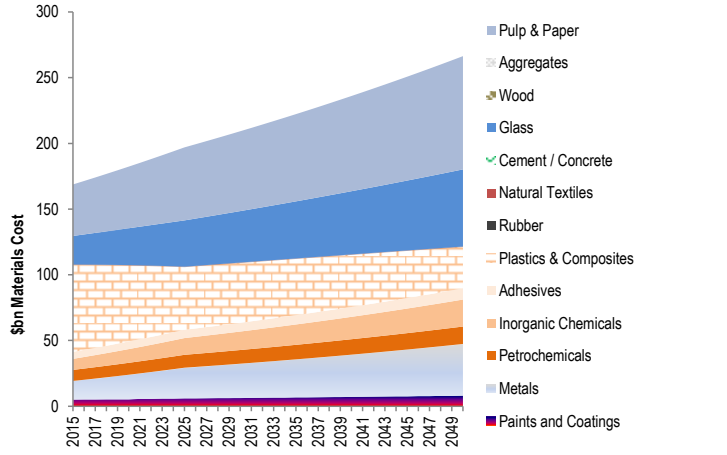
Key sub-themes:

- **Bioplastics and biochems/feedstock:** Bioplastic refers to plastic made from plant or other biological material instead of petroleum. It can be made by extracting sugar from plants such as corn and sugarcane to convert into polylactic acids (PLAs), or made from

polyhydroxyalkanoates (PHAs) engineered from microorganisms. PLA plastic is commonly used in food packaging, while PHA is often used in medical devices. The global bioplastics market generated US$24.38bn in 2017 and is estimated to reach US$68.57bn by 2024 (Allied Market Research).

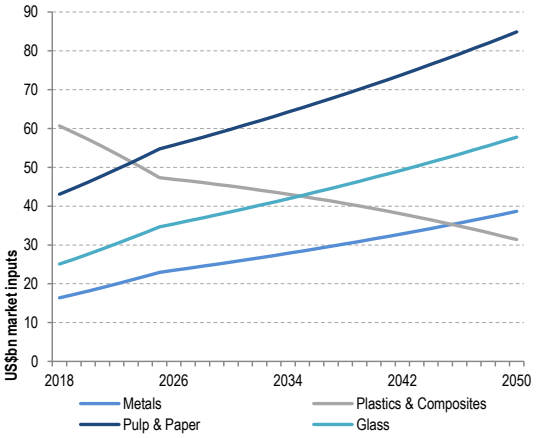
- **Substrate switching and substitution of plastic:** In line with the numerous global targets and commitments to reduce plastic use outright, major FMCGs are in a period of transition as they reevaluate their whole product portfolios with a view to identifying where alternative packaging solutions to plastic are appropriate and beneficial. This was evident in the recent work of the Credit Suisse Chemicals Research team, which developed an Engineering Material Toolkit to score the mechanical, physical, chemical, temperature, price and sustainability properties of ~100 key materials. Under this analysis, the team estimated a 3.4% CAGR decline in plastic packaging revenues out to 2025 (attributed to feedstock demand for petrochems) and a 2.1% decline out to 2050.
  - **Plastic to paper:** Besides consumer plastic packaging, there is also a significant amount of waste generated from business-to-business or business-to-consumer transport in the form of protection or transport packaging. For many years, companies have used Styrofoam and plastic shrink wrap to protect goods, but are beginning to shift away from plastic. Some companies are designing out the need for different forms of protection packaging (Hasbro and Unilever), while others are replacing typical Styrofoam applications with corrugated cardboard (IKEA), among other solutions.

Figure 115: Packaging end-market materials estimates…



Source: Company data, Credit Suisse estimates

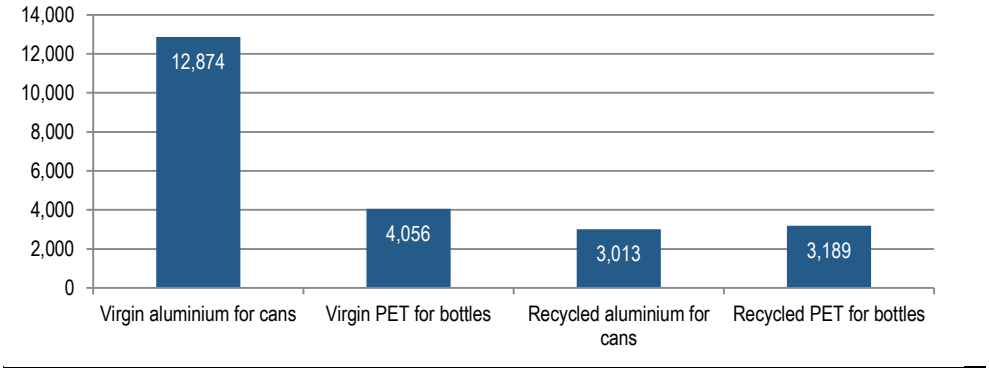
Figure 116: …resulting in substantial substrate rotations



Source: Company data, Credit Suisse estimates

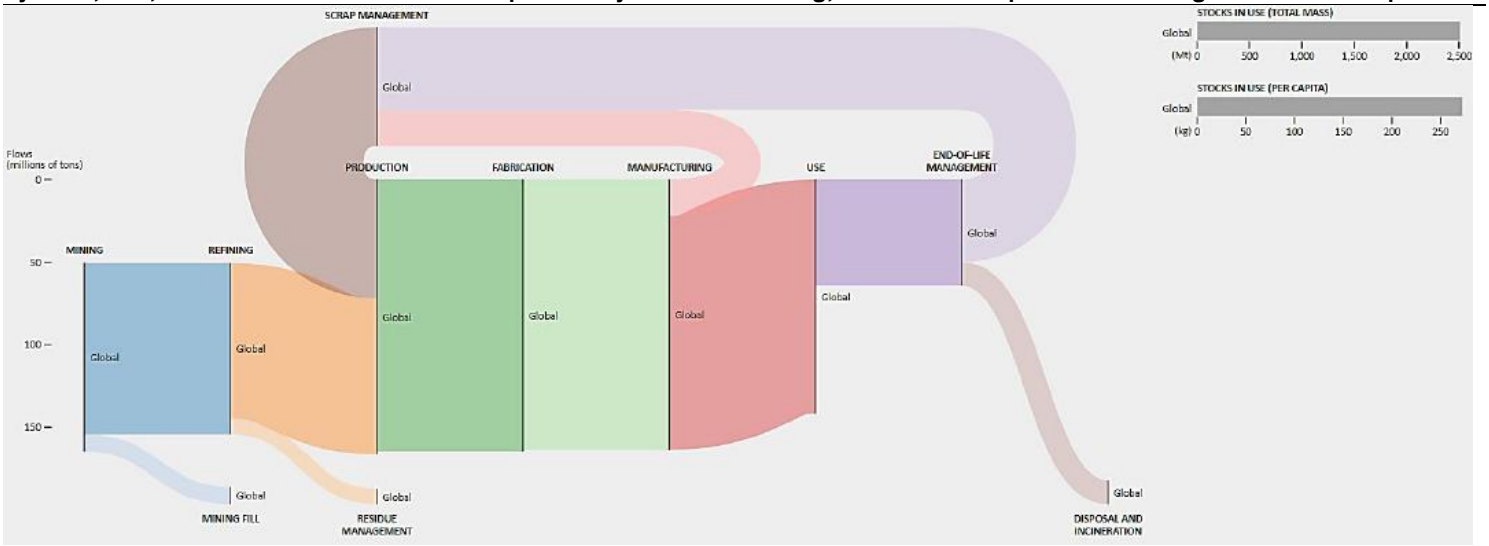
  - **Plastic to aluminium:** Unlike plastic, which can typically be recycled/recovered only 4-5 times, aluminium can be recycled with little loss of quality, regardless of how often it is reprocessed. This is important given the environmental impacts associated with primary aluminium production: it is an energy intensive process that results in environmental degradation and hazardous waste and accounts for c.1% of total global greenhouse emissions (Carbon Trust). Recycled aluminium, however, requires 95% less energy to produce and, given its consistent material properties, exhibits inherent advantages over plastic in achieving higher rates of recycling recovery. It is estimated that c.75% of the aluminium ever produced is still in use today.
  - While the carbon footprint of producing one tonne of the metal varies widely (from around 3tCO2e per tonne using hydropower to 20tCO2e per tonne using coal-fired power), the carbon footprint of recycled aluminium is substantially lower at below 1t CO2e (Carbon Trust). This is relevant when it comes to the carbon impact of using aluminium for packaging, compared with other materials.

Figure 117: Carbon emissions per production of a tonne of material (kgCO2e)



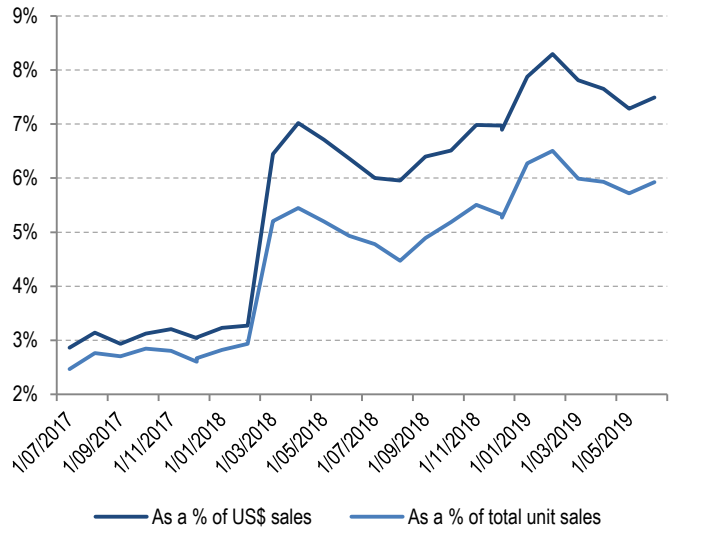
Source: BEIS, 2018, 'GHG conversion factors for company reporting', Credit Suisse research

Figure 118: Under current projections, World Aluminium estimates that as much as 78% of aluminium will be recovered globally by 2040, and, in combination with other scrap recovery in manufacturing, will come to represent 43% of global material input



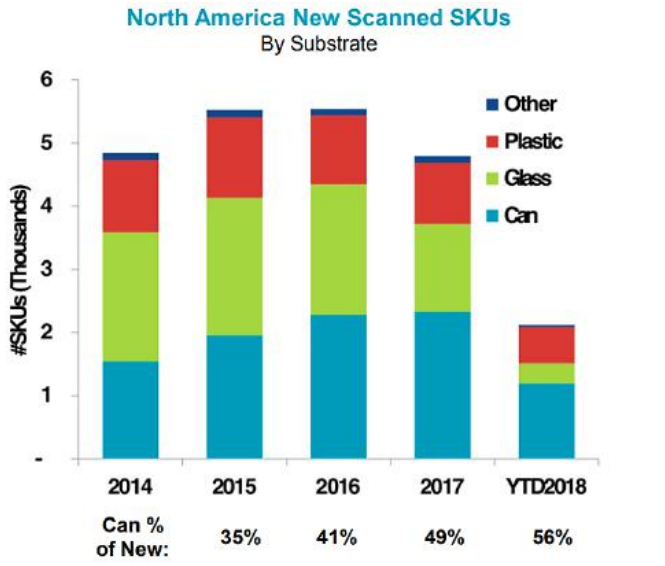
Source: World Aluminium

Figure 119: Proportion of aluminium cans sold in the water beverage segment vs PET bottles in the US (Coca-Cola and PepsiCo sales data)



Source: Nielson, Credit Suisse estimates

Figure 120: North American new beverage products



Source: Open Water company website and IRI data, Ball Corp 2018

Figure 121: Key global CS rated stock exposures to circular economy

Company	TP	CS TP Upside	CS Rating	MC (US$ bn)	P/E		Sales	Earnings	Quality	Momentum	Business Sustainability	Refinitiv ESG Momentum
					12MF	12MF/5Y median	Consensus '20-22' CAGR		Percentile rank			
Novozymes	Dkr320	-12.0%	U	16.6	33.2	20%	4%	9%	55	47	56	1.3%
International Paper Co.	US$48	32.6%	N	14.2	14.5	24%	0%	2%	26	67	48	-1.9%
Mondi	p1855	24.87%	O	11.8	12.7	2%	3%	13%	44	64	52	1.8%
Umicore	€28	-27.05%	U	11.4	27.4	18%	14%	20%	26	79	50	13.5%
Stora Enso	€14	17.65%	O	11.1	17.2	38%	3%	38%	14	66	41	0.0%
Crown Holdings Inc.	US$84	11.54%	O	10.1	13.3	5%	4%	12%	61	69	50	0.0%
Smurfit Kappa	€37	20.45%	O	8.5	12.9	14%	3%	13%	52	72	50	na
WestRock	US$59	92.87%	O	7.9	12.4	-8%	na	na	35	60	53	14.6%
China Everbright International Ltd	HK$9	82.19%	O	3.9	4.5	-60%	5%	11%	41	37	54	na
Cleanaway Waste Management	A$2	-5.15%	N	3.6	29.0	19%	5%	16%	38	54	39	na
Downer EDI	A$5	8.80%	O	2.2	10.9	-20%	3%	22%	39	12	50	na
Sims Metal Management	A$8	-1.55%	N	1.2	32.7	94%	9%	na	20	30	58	na
Dongjiang Environmental Company Limited	HK$7	34.58%	N	1.2	6.6	-48%	13%	19%	43	39	43	na
Bingo Industries	A$2	3.00%	N	1.1	34.2	75%	14%	41%	62	44	30	na
Mercer International Inc.	US$12	40.59%	O	0.5	na	na	21%	na	31	13	45	0.0%

Source: Company data, Credit Suisse estimates

Appendix

Glossary:

BIM: Building Information Modelling
BNEF: Bloomberg New Energy Finance
BOEM: The Bureau of Ocean Energy Management
CCS: Carbon Capture and Storage
EfW: Energy from Waste
EIB: European Investment Bank
ESCAP: The United Nations Economic and Social Commission for Asia and the Pacific
ETS: Emissions Trading Scheme
EVs: Electric Vehicles
GFC: Global Financial Crisis
GHGs: Greenhouse Gas Emissions
HEVs: Hybrid Electric Vehicles
HVAC: Heating, Ventilation, Air Conditioning
ICAO: International Civil Aviation Organisation
ICE: Internal Combustion Engine
ICT: Information, Communication and Technology
IEA: International Energy Association
IECC: International Energy Conservation Code
IEO: International Energy Outlook
IGBT: Insulated Gate Bipolar Transistors
I-IoT: Industrial Internet of Things
IMF: International Monetary Fund
IoT: Internet of Things
IRENA: The International Renewable Energy Agency
JTM: Just Transition Mechanism
LCFS: Low Carbon Fuel Standard
LED: Light Emitting Diode
LiOH: Lithium Hydroxide
MDI: Methylene Diphenyl Diisocyanate
MIIM: Ministry of Industry and Information Technology
MMT: Million Metrics Tons
NEVs: New Energy Vehicles
NREL: The National Renewable Energy Laboratory
OECD: Organisation for Economic Co-operation and Development
PEF: Process Engineers Fuels
PEM: Polymer Electrolyte Membrane
PHAs: Polyhydroxyalkanoates
PLAs: Polylactic Acids
PPA: Power Purchase Agreement
RF: Radiofrequency
SiC: Silicon Carbide
UN SDGs: UN Sustainable Development Goals
UNEP: United Nations Environment Programme
WEF: World Economic Forum
WTO: World Trade Organisation

Uncovered stock exposures to Green Recovery themes

Figure 122: Uncovered stocks with exposure to energy transition

Company	MC (US$ bn)	PE		Sales	Earnings	Quality	Momentum	Business Sustainability	Holt E-Cap Award	Refinitiv ESG Momentum
		12mF	12mF/5yr median	Consensus '20-22' CAGR		Percentile rank				
Hydrogen										
Linde Plc.	131.3	29.5	31%	5%	12%	40	76	47		18.1%
Plug Power	4.9	na	na	37%	na	20	96	34		2.9%
Ballard Pow Syst	3.9	na	na	29%	na	19	45	51		na
Nel	3.1	na	na	44%	na	19	40	53		-3.4%
ITM Power	1.7	na	na	74%	na	18	98	58		na
Powercell Sweden	1.5	na	na	104%	na	29	84	48		na
McPhy Energy	0.5	na	na	67%	na	20	100	59		na
AFC Energy	0.2	na	na	na	na	20	69	43		na
Cell Impact	0.1	na	na	na	na	na	na	50		na
Renewable Energy										
Xcel Energy	36.2	23.7	24%	4%	7%	13	61	40		11.7%
EDP Renovaveis	14.7	33.1	14%	9%	15%	16	63	33		0.0%
AES Corp	11.9	12.1	16%	3%	10%	26	65	32		4.5%
Shanghai Electric Group Company Limited	10.8	26.0	-36%	14%	11%	32	40	50		68.6%
Albemarle Corporation	9.7	22.7	34%	8%	18%	44	53	41		1.3%
AGEL	8.9	na	na	na	na	30	69	30		na
Algonquin Power & Utilities Corp.	8.2	19.8	5%	10%	11%	37	51	46		-7.1%
Acciona	6.6	19.5	10%	5%	26%	18	40	33		0.8%
Sensata Tech	6.5	16.0	23%	12%	41%	87	45	55		81.6%
CSICPCL	6.2	na	na	na	na	18	43	43		0.0%
CPFL Energia	6.1	11.8	-19%	6%	6%	40	55	48		0.0%
Varta	6.0	33.3	-2%	28%	42%	47	90	47		6.6%
Northland Power Inc.	5.7	19.7	15%	2%	-4%	53	50	53		92.6%
Energy Absolute	5.2	22.8	6%	45%	26%	56	27	44	✓	104.7%
Neoen	4.6	91.9	144%	27%	47%	18	65	38		na
ERG	4.0	28.3	33%	3%	13%	13	67	40		0.0%
Vivint Solar	3.5	na	na	12%	na	20	98	45		25.1%
TransAlta Renewables Inc.	3.2	21.7	38%	5%	34%	37	44	55		37.7%
Hannon Armstrong	3.2	27.4	71%	15%	6%	37	81	58		93.4%
Atlantica	3.1	29.2	17%	9%	68%	22	58	39		30.6%
Innergex Renewable Energy Inc.	3.0	na	na	9%	na	28	47	36		30.4%
Scatec Solar	2.7	na	na	23%	15%	33	60	36		13.2%
Boralex Inc.	2.5	63.5	41%	0%	38%	31	75	44		0.0%
Falck Renewables	1.9	36.9	21%	10%	22%	27	56	33		0.0%
Ronbay Tech	1.8	27.8	-18%	42%	40%	21	36	45		na
Canadian Solar	1.6	8.2	4%	13%	-7%	33	77	27		na
Terna Energy	1.5	20.1	54%	17%	36%	28	59	27		-85.7%
SMA Solar Tech	1.5	64.7	34%	5%	45%	16	84	57		-2.6%
Tianwei	1.4	na	na	na	na	21	65	36		-34.6%
OCI Co Ltd	1.4	na	na	8%	na	17	31	36		-3.5%
Nordex	1.4	na	na	-1%	na	29	35	43		0.0%
L&F	1.0	52.2	96%	46%	128%	29	62	39		na
Ecopro	0.8	14.8	-20%	44%	57%	48	86	44		na
BCPG	0.8	11.6	-22%	4%	-3%	69	23	35		na
Infigen	0.6	43.5	167%	na	na	26	45	48		0.0%
Schneider	0.3	na	na	na	na	27	56	26		na
Electrovaya	0.0	10.2	na	na	na	22	68	38		na
Abengoa	0.0	na	na	na	na	19	43	39		5.5%

Source: Company data, Credit Suisse estimates

Figure 123: Uncovered stocks with exposure to transport and infrastructure

Company	MC (US$ bn)	PE		Sales	Earnings	Quality	Momentum	Business Sustainability	Holt E-Cap Award	Refinitiv ESG Momentum
		12mF	12mF/5yr median	Consensus '20-22' CAGR		Percentile rank				
Transport Energy Efficiency										
Continent	21.3	16.4	41%	9%	140%	55	29	47		-0.2%
MTU Aero Engines	9.8	24.9	46%	6%	27%	39	16	49		10.2%
Toray Industries	7.7	18.4	30%	4%	29%	5	22	46		25.0%
Faurecia	5.9	21.9	125%	14%	na	49	16	48		12.7%
Compagnie Pla Om	3.3	61.3	428%	12%	na	47	12	56		0.0%
CIE Automotive	2.2	8.3	-27%	10%	31%	60	10	44	✓	2.5%
WABCO	1.8	na	na	na	na	64	24	57	✓	na
Tenneco	0.7	60.1	739%	11%	na	53	74	39		30.8%
Multi-modal										
Hexagon AB	24.4	26.2	26%	6%	11%	79	88	61	✓	36.8%
Ferrovial	20.3	na	na	6%	na	18	17	38		0.3%
Getlink	8.5	na	na	20%	na	3	47	40		0.9%
Colas	4.5	na	na	na	na	14	43	43		na
National Exps	1.1	9.4	-22%	22%	na	56	7	48	✓	-2.6%
Bertrandt	0.4	11.3	-17%	6%	48%	31	25	37		-12.4%
Electrification										
Daimler	53.6	13.2	79%	9%	150%	35	48	55		0.7%
Volkswagen	52.3	7.8	18%	8%	77%	32	33	55		6.2%
BMW	45.0	10.1	30%	7%	44%	33	61	58		1.4%
Fiat Chrysler	20.3	9.4	104%	10%	na	34	34	52		3.2%
Peugeot	16.8	6.4	-9%	10%	74%	36	29	63		3.5%
Nikola	14.8	na	na	na	na	na	na	50		na
Albemarle Corporation	9.7	22.7	34%	8%	18%	44	53	41		1.3%
Renault	8.7	na	na	8%	na	24	0	51		-4.4%
Valeo	7.1	na	na	13%	na	42	20	49		3.2%
Hella	5.3	19.3	59%	6%	na	13	36	55		-6.7%
Exide Ind	2.0	19.2	-5%	11%	16%	60	49	58	✓	0.0%
Amara Raja	1.7	20.2	-12%	12%	16%	74	32	43		na
Camel Group	1.4	14.3	-2%	17%	18%	49	49	48		na
Elringklinger	0.4	28.0	181%	8%	na	21	42	39		0.0%
Infrastructure - construction										
Vinci	56.0	18.4	20%	8%	53%	26	19	42		-2.2%
Ferrovial	20.3	na	na	6%	na	18	17	38		0.3%
Eiffage	9.6	13.2	-6%	6%	43%	18	31	54		9.7%
Skanska AB	8.2	12.8	-13%	2%	2%	39	39	44		13.7%
Sweco	6.6	37.8	94%	6%	14%	82	88	62	✓	-0.5%
Hochtief	6.5	9.3	-50%	5%	20%	67	11	49		-1.5%
Intl Container	4.4	20.6	7%	7%	12%	50	51	48	✓	33.4%
NWS	3.5	5.7	-47%	na	na	30	28	36		6.9%
Flughafen Wien	2.5	23.8	24%	26%	160%	28	19	46		36.0%
HPH Trust	0.9	13.2	-40%	2%	3%	27	49	45		145.2%
Energy Networks										
Vinci	56.0	18.4	20%	8%	53%	26	19	42		-2.2%
Red Electrica Co	10.5	13.4	-6%	1%	1%	30	56	34		-1.9%
Algonquin Power & Utilities	8.2	19.8	5%	10%	11%	37	51	46		-7.1%
Hubbell	7.9	18.9	10%	5%	12%	82	78	57	✓	0.0%
Regal Beloit	4.0	17.5	34%	5%	19%	60	86	58	✓	29.5%
China XD	3.7	31.1	40%	4%	2%	16	52	53		na
ABB India	2.7	57.2	19%	16%	50%	50	18	53		na
Itron	2.5	33.9	73%	5%	70%	53	30	56		22.3%
TECO	2.0	17.6	26%	2%	0%	21	67	51		105.4%
Alfen	1.2	65.9	75%	29%	63%	67	95	48		na

Source: Company data, Credit Suisse estimates

Figure 124: Uncovered stocks with exposure to energy efficiency

Company	MC (US$ bn)	PE		Sales	Earnings	Quality	Momentum	Business Sustainability	Holt E-Cap Award	Refinitiv ESG Momentum
		12mF	12mF/5yr median	Consensus '20-22' CAGR		Percentile rank				
Buildings										
Daikin Ind	54.9	35.7	91%	7%	25%	56	38	58	✓	5.7%
Carrier Global Corporation	26.4	18.5	28%	7%	17%	51	71	72		na
Cie Saint Gobain	21.8	13.2	3%	5%	31%	21	45	53		6.1%
Kingspan Group	15.5	37.0	87%	7%	12%	71	66	57	✓	8.6%
Sekisui House	13.7	10.9	8%	3%	6%	35	38	48		6.2%
Nibe Industrier	12.7	48.4	116%	5%	10%	69	91	56	✓	-4.6%
ACS ES	8.0	8.7	-24%	4%	21%	46	7	52		3.8%
WSP Global	7.5	24.2	37%	2%	15%	69	33	51	✓	25.0%
Cree	6.9	na	na	21%	na	8	37	47		26.3%
FCC	3.9	10.5	-38%	4%	13%	9	27	37		0.0%
Louisiana-Pacifc	3.7	14.3	0%	na	na	38	95	58		-3.4%
Taiheiyo Cement	3.0	8.7	-10%	2%	11%	9	26	44		20.1%
Beacon Roofing	2.2	14.0	-6%	3%	13%	80	77	46		67.9%
Nichias	1.6	12.0	11%	2%	11%	33	37	55		na
SZ Tech Eco	1.1	6.5	-59%	na	na	32	46	31		na
Caverion	1.0	18.8	8%	3%	35%	50	61	46		10.3%
Forterra	0.9	14.8	-15%	4%	50%	50	97	48		3.5%
Ibstock	0.8	15.8	35%	12%	55%	47	7	52		8.0%
Palm Eco Town	0.8	na	na	na	na	22	54	26		na
HDC Holdings	0.5	2.1	-70%	14%	5%	41	69	30		-20.1%
Industrials										
Daikin Ind	54.9	35.7	91%	7%	25%	56	38	58	✓	5.7%
Carrier Global Corporation	26.4	18.5	28%	7%	17%	51	71	72		na
Cie Saint Gobain	21.8	13.2	3%	5%	31%	21	45	53		6.1%
Kingspan Group	15.5	37.0	87%	7%	12%	71	66	57	✓	8.6%
Sekisui House	13.7	10.9	8%	3%	6%	35	38	48		6.2%
Nibe Industrier	12.7	48.4	116%	5%	10%	69	91	56	✓	-4.6%
ACS ES	8.0	8.7	-24%	4%	21%	46	7	52		3.8%
WSP Global	7.5	24.2	37%	2%	15%	69	33	51	✓	25.0%
Cree	6.9	na	na	21%	na	8	37	47		26.3%
FCC	3.9	10.5	-38%	4%	13%	9	27	37		0.0%
Louisiana-Pacifc	3.7	14.3	0%	na	na	38	95	58		-3.4%
Taiheiyo Cement	3.0	8.7	-10%	2%	11%	9	26	44		20.1%
Beacon Roofing	2.2	14.0	-6%	3%	13%	80	77	46		67.9%
Nichias	1.6	12.0	11%	2%	11%	33	37	55		na

Source: Company data, Credit Suisse estimates

Figure 125: Uncovered stocks with exposure to circular economy

Company	MC (US$ bn)	P/E		Sales	Earnings	Quality	Momentum	Business Sustainability	Holt E-Cap Award	Refinitiv ESG Momentum
		12MF	12MF/5Y median	Consensus '20-22' CAGR		Percentile rank				
Circular Economy										
Ball Corporation	25.3	25.0	36%	6%	16%	60	66	48	✓	-3.5%
Veolia Environ	12.6	17.6	7%	4%	35%	13	34	46		4.7%
Packaging Corp	9.4	18.4	23%	1%	-3%	53	44	51	✓	20.3%
Suez	9.0	33.1	82%	4%	na	13	25	48		na
Tomra Systems	6.7	62.9	131%	6%	19%	78	45	56		17.2%
DS Smith	4.8	10.5	-18%	1%	6%	37	21	49		8.2%
BillerudKorsnas	3.5	24.1	66%	5%	73%	14	51	38		-3.3%
Corbion	2.5	29.1	41%	3%	26%	39	80	47		2.2%
Elkem	1.2	11.8	40%	7%	63%	na	na	31		na
Ranpak Holdings	0.6	na	na	na	na	na	na	50		na
Loop Inds	0.4	na	na	na	na	na	na	50		na
Carbios	0.3	na	na	18%	na	14	81	53		na
Avantium	0.2	na	na	3%	na	20	37	40		na
Phoslock env	0.1	na	na	na	na	45	34	53		na

Source: Company data, Credit Suisse estimates

European O&G: Transition Strategies

- **BP:** With its 2Q results in August BP announced its new medium-term strategy, which indicates a significant acceleration on energy transition relative to peers. BP plans to reduce its hydrocarbon exposure over the next decade by 40% (excluding Rosneft) taking production to ~1.1 mb/d by 2030; this goes hand-in-hand with a planned scope 3 emissions reduction of 35-40% in absolute terms on its upstream portfolio. Some of this will be met via asset disposals (now targeting $25bn over 2H 2020-25). In renewables, BP has set the most ambitious target of all EU Oils for 50GW equity capacity by 2030, despite having only 2.5GW of equity capacity today. This indicates a level of annual equity capacity additions comparable to leading utilities (Enel, Iberdrola) over the coming decade. This is also accompanied with a new capex framework, with low-carbon capex of $5bn by 2030 (compared to its total capex guidance of $14-16bn by 2025). BP's strategy also includes several other elements, including growing in areas such as mobility, EV charging, hydrogen, and power trading. Click here to read our full report on BP's new strategy.

- **Equinor:** announced that its Massachusetts lease area (OCS-A 0520) has been named Beacon Wind, and will undertake survey work this summer on the project. With SSE, Equinor also announced that the Port of Tyne has been selected as the O&M base for Dogger Bank. On other UK farms, Equinor has submitted a scoping report for the Dudgeon and Sheringham Shoal Extension Projects (402MW, 317MW respectively), which Equinor is looking to develop as a single integrated project with a shared grid option. Furthermore the Northern Lights CCS project (also with interest from Shell and Total) has submitted plans to the Norwegian government for the $685m project. Phase 1 is for 1.5 mtpa of storage (2024), with potential expansion to 5 mtpa. FID is now subject to approval from Norwegian authorities and the AFTA Surveillance Authority. Equinor has also made smaller investments; into the commercial development of fusion power (Commonwealth Fusion Systems, which also attracted investment from ENI and Breakthrough Energy Ventures) and into Brazilian 'storage-as-a-service' company, Micropower Comerc.

- **Repsol:** Started construction of the Kappa solar farm in Spain (126MW) in late April, and the Valdesolar project (264MW) also started construction in July. The Delta onshore wind farm (335MW) was already in construction (commenced in December 2019), which is expected to be operational by the end of this year. These three projects (which have a combined capacity of 726MW, similar in size to Repsol's existing operational renewables portfolio of ~07GW) represent an investment of €600m compared to our forecast 2020 capex of ~€2.7-2.8bn, or roughly 20%. Repsol has also been adding to its pipeline: Earlier this year we saw Repsol also announced the Delta 2 onshore wind project of 860MW in its portfolio. Notably with 2Q results we saw Repsol also form a 50/50 JV with Grupo Ibereólica Renovables to develop five renewables projects in Chile within the next five years, for a gross capacity of ~1.6GW, as well as plans for a further 1.0GW gross capacity to be developed by 2030—thus adding ~1.3GW of total pipeline to Repsol's existing portfolio, and taking Repsol's total renewables assets in operation or pipeline to ~4.1GW.

- **Shell:** In addition to the Northern Lights project Shell is participating in, Shell was recently awarded the Hollandse Kust Noord offshore wind site tender (759MW) as part of a JV bid with Eneco (called 'CrossWind'), with both companies having taken FID on this project, expected to be operational in 2023. This marks the fourth offshore wind addition to Shell's renewables pipeline which is now ~3GW equity capacity, in addition to the ~0.7GW capacity in operation. While this is smaller than peers in GW terms, we note that the strong exposure to offshore wind provides benefits (more power output per GW installed, superior cash flow visibility in projects with support mechanisms, higher capital intensity). This award was also integrated with several technology demonstrations such as battery storage, floating solar, and a significant green hydrogen project. This demonstrates the fruits of RDS' strategy in having expertise across several clean technologies, and becoming a provider of broad clean energy solutions. Winning a competitive zero-subsidy tender (which also attracted a bid from offshore wind leader Ørsted) demonstrates its capability to grow in power generation, but adding these technology demonstrations would have likely contributed to a successful bid.

The integrated green hydrogen facility at the Port of Rotterdam (~200MW) would potentially produce 50-60,000 kg of hydrogen per day in 2023 to be used at Shell's Pernis refinery. Applying this expertise to future tenders may be valuable; CFO Uhl noted that RDS is looking to act more quickly and intensely on Energy Transition than 12 months ago.

- **Total:** We saw three significant announcements from Total recently. First, Total announced new long-term emissions ambitions up to 2050 (in a joint statement with Climate Action 100+). Total's previous aim was to reduce the full-cycle carbon intensity of its products by 15% by 2030. This is unchanged; however, Total additionally aims for a 35% reduction by 2040 (we note that the 2019 climate strategy report indicated the 2030 goal may be extended to a range of 25-40% by 2040), and 60% reduction by 2050. With this announcement Total also announced that by 2030 or sooner, capex towards low-carbon electricity will increase to 20% of total capex. Second, Total acquired generation (two CCGT plants of ~0.85GW) and 2.5mn B2C customers in Spain from EDP. Lastly, Total agreed to acquire a 51% stake in SSE's Seagreen offshore wind project (1.14GW gross capacity). With its many transactions in 2020, we see that Total has expanded its gross renewable capacity to 5GW gross (from 3GW in 2019), with a further 4.8GW gross in pipeline to help achieve the target of 25GW gross renewable capacity by 2025. As a result of this activity Total also now guides to $2bn low-carbon net investment for 2020, the top of the previously indicated range (~15% of the total 2020 guidance of <$14bn). Total has also moved to reshape parts of its Oil & Gas business, taking ~$7bn in impairments on Canadian Sands assets following a stranded asset review.
- **ENI:** In early June ENI announced a new business structure. This is split into two groups: 'Natural Resources', composed of upstream assets as well as energy efficiency/CCS assets, and 'Energy Evolution', composed of power generation, product transformation and marketing (including fossil products marketing). As part of the previously unveiled strategy, the former group will focus on growing gas in the upstream as well as developments to reduce the carbon footprint of the upstream (including natural sinks, CCS, and efficiency). The latter segment will focus on meeting other objectives, such as ENI's renewables and bio-refining growth. With 2Q results ENI also indicated a greater 'green' capex allocation: previously guidance was for €4bn into low-carbon areas from 2020-23, however this was increased to €4.8bn (this includes not only renewables generation, but areas such as bio-refining and CCS). This represents nearly ~18% of its capex across this period, but will be increasing over this period: by 2023 the share of low-carbon capex is indicated at 26%.
- **OMV:** While not moving aggressively into renewable power generation compared to EU IOC peers, OMV unveiled new emissions targets at the end of July. This includes a long-term ambition for Net Zero Scope 1+2 emissions by 2050 or sooner, and a 30% lower intensity by 2025. On Scope 3, OMV targets a 6% reduction in emissions intensity (vs 2010) having achieved its previously set target of a 4% reduction in 2019. While these are positive developments, this Scope 3 target is not as competitive as peers, and OMV still lacks a long-term Scope 3 ambition.

Companies Mentioned *(Price as of 30-Aug-2020)*

ABB (ABBN.S, SFr23.27)
ABB India (ABB.BO, Rs985.35)
ACS (ACS.MC, €21.22)
AES Corporation (AES.N, $17.9)
AFC Energy (AFEN.L, 19.5p)
AGEL (ADNA.BO, Rs462.15)
Abengoa (ABG.MC, €0.0161)
Aboitiz Power Corp (AP.PS, P26.65)
Acciona SA (ANA.MC, €101.2)
Acuity Brands (AYI.N, $110.94)
Aena (AENA.MC, €128.8)
Aggreko (AGGK.L, 477.2p)
Air Liquide (AIRP.PA, €139.6)
Air Products & Chemicals (APD.N, $296.76)
Airbus SE (AIR.PA, €71.44)
Airtac (1590.TW, NT$697.0)
Aisin Seiki (7259.T, ¥3,575)
Albemarle Corporation (ALB.N, $92.32)
Albertsons Cos (ACI.N, $14.36)
Alfa Laval (ALFA.ST, Skr215.7)
Alfen (ALFEN.AS, €62.5)
Algonquin Power & Utilities Corp. (AQN.TO, C$18.01)
Alstom (ALSO.PA, €47.39)
AltaGas Ltd. (ALA.TO, C$17.26)
Amara Raja (AMAR.BO, Rs735.55)
Ambuja Cements (ABUJ.BO, Rs222.2)
American Axle & Manufacturing Holdings, Inc. (AXL.N, $7.96)
Analog Devices Inc. (ADI.OQ, $119.58)
Applus (APPS.MC, €6.96)
Aptiv PLC (APTV.N, $87.25)
Arkema (AKE.PA, €93.06)
Asahi Glass (5201.T, ¥3,020)
Ashland Global Holdings Inc. (ASH.N, $75.43)
Atlantica (AY.OQ, $29.77)
AusNet Services (AST.AX, A$1.82)
Avantium (AVTX.AS, €5.92)
Azure Power Global Limited (AZRE.N, $25.05)
BASF (BASFn.DE, €51.32)
BCPG (BCPG.BK, Bt13.4)
BMW (BMWG.DE, €59.61)
BP (BP.L, 264.2p)
BTS Group Holdings PCL (BTS.BK, Bt10.6)
BYD Co Ltd (002594.SZ, Rmb85.39)
BYD Co Ltd (1211.HK, HK$77.15)
Ball Corporation (BLL.N, $80.27)
Ballard Pow Syst (BLDP.TO, C$20.96)
Bangkok Expressway and Metro PLC (BEM.BK, Bt9.3)
Barratt Developments (BDEV.L, 525.2p)
Beacon Roofing (BECN.OQ, $33.52)
Beijing Easpring Material Technology (300073.SZ, Rmb37.83)
Bertrandt (BDTG.DE, €32.8)
Bilfinger (GBFG.DE, €17.01)
BillerudKorsnas (BILL.ST, Skr145.3)
Bingo Industries (BIN.AX, A$2.3)
Bloom Energy (BE.N, $16.31)
Boeing (BA.N, $175.8)
Boralex Inc. (BLX.TO, C$33.02)
BorgWarner, Inc. (BWA.N, $41.43)
Bouygues (BOUY.PA, €34.25)
Brookfield Asset Management (BAM.N, $34.84)
Brookfield Infrastructure Partners LP (BIP.N, $44.34)
Brookfield Renewable Partners (BEP_u.TO, C$60.54)
CF Industries Holding Inc. (CF.N, $33.21)
CIE Automotive (CIEA.MC, €14.88)
CIMIC Group Limited (CIM.AX, A$21.4)
CK Infrastructure (1038.HK, HK$41.2)
CMS Energy Corp (CMS.N, $60.05)
CPFL (CPFE3.SA, R$29.5)
CRH (CRH.I, €31.88)
CSICPCL (600482.SS, Rmb20.16)
CSR (CSR.AX, A$3.6)
CSX Corporation (CSX.OQ, $77.07)
Calisen Plc (CLSN.L, 176.0p)
Camel Group (601311.SS, Rmb8.28)
Canadian National (CNI.N, $106.34)
Canadian Solar (CSIQ.OQ, $32.52)
Canadian Utilities Limited (CU.TO, C$33.01)
Capital Power Corporation (CPX.TO, C$29.18)
Carbios (ALCRB.PA, €30.6)
Carrier Global Corporation (CARR.N, $30.3)
Caverion (CAV1V.HE, €6.16)
Cell Impact (CIb.ST, Skr24.4)
CenterPoint Energy Inc (CNP.N, $19.95)
Chart Industries, Inc. (GTLS.OQ, $67.25)
China Everbright International Ltd (0257.HK, HK$4.73)
China Railway Construction Corporation Limited (1186.HK, HK$6.15)
China Railway Construction Corporation Limited (601186.SS, Rmb8.88)

China Railway Group Limited (0390.HK, HK$4.01)
China Railway Group Limited (601390.SS, Rmb5.49)
China XD (601179.SS, Rmb4.91)
China Yangtze Power Co Ltd (600900.SS, Rmb18.99)
Chiyoda Corp (6366.T, ¥267)
Chroma (2360.TW, NT$164.5)
Cisco Systems (CSCO.OQ, $42.2)
Cleanaway Waste Management (CWY.AX, A$2.53)
Colas (COLP.PA, €118.0)
Consolidated Edison (ED.N, $70.92)
Contemporary Amperex Technology Co., Limited (300750.SZ, Rmb208.3)
Continental (CONG.DE, €91.36)
Corbion (CORB.AS, €37.6)
Corteva, Inc. (CTVA.N, $29.52)
Covestro (1COV.DE, €39.84)
Cree (CREE.OQ, $63.74)
Crown Holdings Inc. (CCK.N, $77.19)
Cummins Inc. (CMI.N, $208.72)
DS Smith (SMDS.L, 258.7p)
DTE Energy (DTE.N, $117.86)
Daikin Industries (6367.T, ¥19,765)
Daimler (DAIGn.DE, €42.88)
Dana, Inc. (DAN.N, $14.11)
Daqo New Energy (DQ.N, $125.17)
Delphi Technologies PLC (DLPH.N, $17.7)
Delta Electronics (2308.TW, NT$194.0)
Denso (6902.T, ¥4,373)
Dongjiang Environmental Company Limited (0895.HK, HK$4.88)
Dongjiang Environmental Company Limited (002672.SZ, Rmb10.63)
Downer EDI (DOW.AX, A$4.35)
Drax (DRX.L, 280.2p)
Duke Energy (DUK.N, $79.71)
DunAnEnvironment (002011.SZ, Rmb4.11)
E.ON (EONGn.DE, €9.926)
EDP (EDP.LS, €4.261)
EDP Renováveis (EDPR.LS, €14.36)
ENI (ENI.MI, €7.962)
ERG (ERG.MI, €22.16)
Eaton Corporation (ETN.N, $103.51)
Ecopro (086520.KQ, W43,500)
Eiffage (FOUG.PA, €79.8)
Electrolux (ELUXb.ST, Skr187.95)
Electrovaya (EFL.TO, C$0.58)
Elkem (ELK.OL, Nkr18.04)
Elringklinger (ZILGn.DE, €5.97)
Emera Inc. (EMA.TO, C$53.31)
Emerson Electric (EMR.N, $70.65)
Enbridge Inc. (ENB.TO, C$42.65)
Endesa (ELE.MC, €23.3)
Enel (ENEI.MI, €7.64)
Energy Absolute (EA.BK, Bt43.0)
Engie (ENGIE.PA, €11.135)
Enphase Energy (ENPH.OQ, $76.04)
Epistar Corporation (2448.TW, NT$39.1)
Equinor ASA (EQNR.OL, Nkr142.75)
Eversource Energy (ES.N, $84.77)
Exide Industries (EXID.BO, Rs172.25)
FANUC Corporation (6954.T, ¥18,590)
FMC Corporation (FMC.N, $109.15)
Falck Renewables (AA4.MI, €5.57)
Faurecia (EPED.PA, €36.99)
Ferguson PLC (FERG.L, 7376.0p)
Ferrovial SA (FER.MC, €23.01)
Fiat Chrysler Automobiles N.V. (FCHA.MI, €9.415)
First Gen Corporation (FGEN.PS, P24.35)
First Solar (FSLR.OQ, $80.0)
Flowserve Corp. (FLS.N, $30.53)
Flughafen Wien (VIEV.VI, €24.75)
Fomento De Construcciones (FCC.MC, €7.95)
Ford Motor Company (F.N, $6.94)
Forterra (FRTA.OQ, $13.48)
Fortis Inc. (FTS.TO, C$52.14)
Fuji Electric (6504.T, ¥3,275)
GCL New Energy Holdings (0451.HK, HK$0.151)
GS Yuasa Corp (6674.T, ¥1,749)
Galp Energia (GALP.LS, €9.14)
Geberit (GEBN.S, SFr522.8)
General Electric (GE.N, $6.61)
General Motors Company (GM.N, $30.02)
Gree Electric (000651.SZ, Rmb55.04)
Groupe Eurotunnel SA (GETP.PA, €13.16)
Guangshen Railway (0525.HK, HK$1.55)
Guangshen Railway (601333.SS, Rmb2.47)
Haier Smart Home (600690.SS, Rmb23.24)
Halma (HLMA.L, 2218.0p)
Hannon Armstrong (HASI.N, $42.4)
Hanon Systems (018880.KS, W13,050)
Hasbro (HAS.OQ, $80.94)

Havells India Ltd (HVEL.BO, Rs639.25)
Hella (HLE.DE, €41.2)
Hexagon AB (HEXAb.ST, Skr622.6)
Hexcel Corporation (HXL.N, $41.47)
Hitachi (6501.T, ¥3,530)
Hiwin (2049.TW, NT$334.0)
Hochtief (HOTG.DE, €76.9)
Hollysys Automation Technologies Ltd. (HOLI.OQ, $10.48)
Honeywell International Inc. (HON.N, $168.38)
Hubbell (HUBB.N, $146.02)
Hutchison Port Holdings Trust (HPHT.SI, $0.103)
Hydro One Limited (H.TO, C$27.24)
Hyundai Development (012630.KS, W11,200)
Hyundai Mobis (012330.KS, W226,000)
Hyundai Motor Company (005380.KS, W172,000)
IBP (IBP.N, $88.33)
IMI (IMI.L, 1055.0p)
ITM Power (ITM.L, 277.0p)
Iberdrola (IBE.MC, €10.7)
Ibstock (IBST.L, 154.7p)
Indra (IDR.MC, €6.19)
Infigen Energy (IFN.AX, A$0.92)
Infineon Technologies AG (IFXGn.DE, €23.335)
Ingersoll-Rand Inc. (IR.N, $35.76)
Innergex Renewable Energy Inc. (INE.TO, C$22.45)
Int'l Container Terminal Inc. (ICT.PS, P105.0)
International Paper Co. (IP.N, $36.93)
Italgas (IG.MI, €5.36)
Itron (ITRI.OQ, $60.55)
JGC Corp (1963.T, ¥1,146)
James Hardie Industries plc (JHX.AX, A$31.28)
Jinko Solar (JKS.N, $23.25)
Johnson Controls Inc (JCI.N, $41.3)
Johnson Matthey (JMAT.L, 2375.0p)
K+S AG (SDFGn.DE, €5.92)
Kaneka (4118.T, ¥2,685)
Keihin (7251.T, ¥2,577)
Keyera Corp. (KEY.TO, C$24.45)
Kingspan (KSP.I, €71.5)
Knorr-Bremse (KBX.DE, €106.06)
Kone Corporation (KNEBV.HE, €72.44)
Kuka (KU2G.DE, €36.3)
L&F (066970.KQ, W42,950)
LG Chem Ltd. (051910.KS, W759,000)
LG Innotek (011070.KS, W147,000)
LafargeHolcim (LHN.S, SFr43.0)
Landis + Gyr (LANDI.S, SFr58.05)
Lear Corporation (LEA.N, $116.83)
Legrand SA (LEGD.PA, €70.28)
Lennox International (LII.N, $284.69)
Lincoln National (LNC.N, $37.39)
Linde Plc. (LIN.N, $253.57)
Livent Corporation (LTHM.N, $8.65)
Longyuan Power (0916.HK, HK$4.89)
Loop Inds (LOOP.OQ, $10.82)
Louisiana-Pacific Corp. (LPX.N, $33.89)
MTU Aero Engines (MTXGn.DE, €157.8)
Magna International Inc. (MGA.N, $50.67)
Maxim Integrated Products (MXIM.OQ, $70.22)
McPhy Energy (MCPHY.PA, €23.85)
Mercer International Inc. (MERC.OQ, $8.48)
MinebeaMitsumi (6479.T, ¥1,825)
Mitsubishi Electric (6503.T, ¥1,464)
Mondi (MNDI.L, 1461.0p)
Murata Manufacturing (6981.T, ¥6,284)
NKT (NKT.CO, Dkr194.6)
NRG Yield (CWENa.N, $24.46)
NWS Holding Ltd (0659.HK, HK$6.49)
National Exps (NEX.L, 126.0p)
National Grid (NG.L, 843.2p)
Nel (NEL.OL, Nkr20.35)
Neoen (NEOEN.PA, €44.8)
Nestle (NESN.S, SFr108.86)
Nexans (NEXS.PA, €47.76)
NextEra Energy Inc. (NEE.N, $279.55)
NextEra Energy Partners (NEP.N, $60.35)
Nibe Industrier (NIBEb.ST, Skr243.1)
Nichias (5393.T, ¥2,505)
Nidec (6594.T, ¥8,767)
Nikola (NKLA.OQ, $41.35)
Ningbo Shanshan (600884.SS, Rmb11.55)
Norbord Inc (OSB.TO, C$47.45)
Nordex (NDXG.DE, €11.13)
Northland Power Inc. (NPI.TO, C$37.03)
Novozymes (NZYMb.CO, Dkr365.6)
OCI Company Ltd (010060.KS, W63,100)
OCI NV (OCI.AS, €11.49)
OHL (OHL.MC, €0.6)

Omega Geracao (OMGE3.SA, R$40.08)
Omron (6645.T, ¥7,700)
Orbia Advance Corp (ORBIA.MX, MXN36.57)
Owens Corning (OC.N, $69.17)
PSA Peugeot Citroen (PEUP.PA, €14.605)
Packaging Corp. of America (PKG.N, $102.27)
Palm Eco Town (002431.SZ, Rmb3.68)
Panasonic (6752.T, ¥970)
Parker Hannifin Corporation (PH.N, $210.47)
Pembina Pipeline Corporation (PPL.TO, C$33.08)
PepsiCo (PEP.OQ, $139.94)
Philips (PHG.AS, €41.09)
Phoslock env (PET.AX, A$0.3)
Pinnacle West Capital Corp. (PNW.N, $73.48)
Plastic Omnium (PLOF.PA, €19.0)
Plug Power (PLUG.OQ, $13.07)
Powercell Sweden (PCELL.ST, Skr243.0)
Powergrid Corporation (PGRD.BO, Rs182.3)
Prysmian (PRY.MI, €23.86)
ROHM (6963.T, ¥6,770)
RWE (RWEG.F, €32.87)
Ranpak Holdings (PACK.N, $8.94)
Raytheon Technologies (RTX.N, $62.24)
Red Electrica (REE.MC, €15.885)
Regal Beloit (RBC.N, $99.66)
Renault (RENA.F, €24.175)
Renesas Electronics (6723.T, ¥660)
Repsol (REP.MC, €6.902)
Rexnord Corporation (RXN.N, $29.68)
Rinnai (5947.T, ¥9,670)
Rockwell Automation (ROK.N, $233.27)
Rockwool Intl (ROCKb.CO, Dkr2336.0)
Rolls-Royce (RR.L, 241.1p)
Ronbay Tech (688005.SS, Rmb27.99)
Rotork (ROR.L, 299.8p)
Royal Dutch Shell plc (RDSa.L, 1106.8p)
SMA Solar Tech (S92G.DE, €38.44)
SSE (SSE.L, 1259.0p)
STMicroelectronics NV (STM.PA, €25.3)
SUMCO (3436.T, ¥1,435)
SZ Tech Eco (300197.SZ, Rmb3.21)
Safran (SAF.PA, €102.25)
Saint-Gobain (SGOB.PA, €34.16)
Schindler-Holding AG (SCHP.S, SFr239.1)
Schneider (SEIN.BO, Rs87.2)
Schneider Electric (SCHN.PA, €105.0)
Sekisui House (1928.T, ¥2,096)
Semen Indonesia (SMGR.JK, Rp10,650)
Sensata Tech (ST.N, $42.21)
Seoul Semiconductor Co Ltd (046890.KQ, W16,250)
Shanghai Electric Group Company Limited (601727.SS, Rmb5.55)
Shanghai Electric Group Company Limited (2727.HK, HK$2.36)
Shell Midstream Partners LP (SHLX.N, $10.74)
Siemens (SIEGn.DE, €118.22)
Siemens Gamesa (SGREN.MC, €22.27)
Signify (LIGHT.AS, €28.3)
Sika (SIKA.S, SFr214.2)
Sims Metal Management (SGM.AX, A$8.04)
Skanska AB (SKAb.ST, Skr177.55)
Smurfit Kappa (SKG.I, €30.16)
Snam (SRG.MI, €4.334)
SolarEdge Technologies (SEDG.OQ, $221.19)
Solvay (SOLB.BR, €72.76)
Southern Company (SO.N, $52.42)
Spark Infrastructure Group (SKI.AX, A$2.19)
Spectris (SXS.L, 2536.0p)
Spie (SPIE.PA, €14.48)
Stora Enso (STERV.HE, €12.115)
Suez (SEVI.PA, €12.24)
SunPower (SPWR.OQ, $11.43)
Sunnova Energy International (NOVA.N, $24.54)
Sweco (SWECb.ST, Skr530.5)
TC Energy (TRP.TO, C$62.22)
TE Connectivity (TEL.N, $97.94)
TILT Renewables (TLT.NZ, NZ$3.6)
Taiheiyo Cement (5233.T, ¥2,643)
Taiyo Yuden (6976.T, ¥2,861)
Teco (1504.TW, NT$29.3)
Tenneco Inc. (TEN.N, $8.54)
Terna (TRN.MI, €6.1)
Terna Energy (TENr.AT, €11.86)
Tesla Inc (TSLA.OQ, $442.68000000000006)
Thales (TCFP.PA, €67.98)
Tianwei Baobian (600550.SS, Rmb5.22)
Tomra Systems (TOM.OL, Nkr415.0)
Tongwei (600438.SS, Rmb23.67)
TopBuild (BLD.N, $156.76)
Toray Industries (3402.T, ¥505)

Total (TOTF.PA, €33.3)
Trane Technologies (TT.N, $120.3)
TransAlta Corporation (TA.TO, C$8.52)
TransAlta Renewables Inc. (RNW.TO, C$15.89)
Ultratech Cement Ltd (ULTC.BO, Rs4062.45)
Umicore (UMI.BR, €38.49)
Unilever (ULVR.L, 4460.0p)
Unilever (UNA.AS, €48.98)
VINCI (SGEF.PA, €81.5)
Valeo (VLOF.PA, €25.71)
Varta (VAR1.DE, €127.4)
Veolia Environnement (VIE.PA, €19.105)
Verbund (VERB.VI, €45.5)
Vestas (VWS.CO, Dkr942.6)
Volkswagen (VOWG.DE, €152.2)
WSP Global (WSP.TO, C$89.0)
Wabco India Ltd. (WABC.BO, Rs6914.75)
Wacker Chemie (WCHG.DE, €82.7)
Wartsila (WRT1V.HE, €7.146)
Watsco (WSO.N, $246.35)
Weichai Power (000338.SZ, Rmb14.9)
Weichai Power (2338.HK, HK$15.72)
Wesco International (WCC.N, $48.34)
WestRock (WRK.N, $31.06)
Woodward Inc (WWD.OQ, $87.54)
Xcel Energy (XEL.OQ, $68.65)
Xinjiang Goldwind Science & Technology Co., Ltd. (2208.HK, HK$7.37)
Xinjiang Goldwind Science & Technology Co., Ltd. (002202.SZ, Rmb11.53)
Xinyi Solar Holdings (0968.HK, HK$9.75)
Yara International ASA (YAR.OL, Nkr367.7)
Yokogawa Electric Corp (6841.T, ¥1,696)
Zhuzhou CRRC Times Electric Co., Ltd (3898.HK, HK$24.45)
ams AG (AMS.S, SFr15.93)
Ørsted (ORSTED.CO, Dkr884.0)

Disclosure Appendix

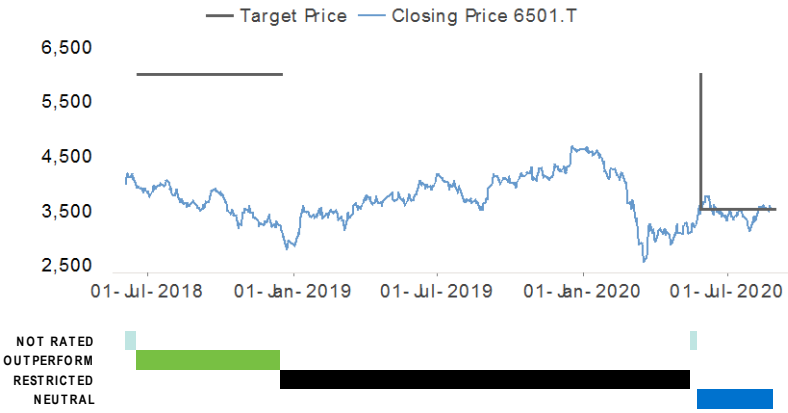
Analyst Certification

Phineas Glover, Eugene Klerk, Betty Jiang, CFA, Andrew M. Kuske, Chris Counihan, Dan Levy, Michael Weinstein, ERP, Mark Freshney, Akinori Kanemoto, John Walsh and Arjun Saini each certify, with respect to the companies or securities that the individual analyzes, that (1) the views expressed in this report accurately reflect his or her personal views about all of the subject companies and securities and (2) no part of his or her compensation was, is or will be directly or indirectly related to the specific recommendations or views expressed in this report.

3-Year Price and Rating History for Hitachi (6501.T)

6501.T	Closing Price	Target Price	
Date	(¥)	(¥)	Rating
05-Jun-18	3,989		NR
18-Jun-18	3,964	6,000	O
17-Dec-18	3,221		R
18-May-20	3,109		NR
28-May-20	3,580	3,520	N

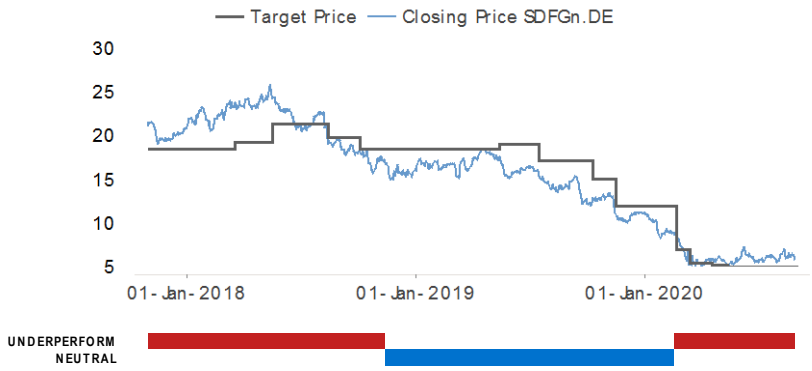
** Asterisk signifies initiation or assumption of coverage.*



3-Year Price and Rating History for K+S AG (SDFGn.DE)

SDFGn.DE	Closing Price	Target Price	
Date	(€)	(€)	Rating
30-Aug-17	20.01	18.50	U
19-Mar-18	23.26	19.30	
17-May-18	24.85	21.30	
14-Aug-18	20.02	19.80	
04-Oct-18	18.27	18.50	
16-Nov-18	16.86	18.50	N
14-May-19	17.48	19.00	
16-Jul-19	15.96	17.20	
10-Oct-19	12.44	15.00	
15-Nov-19	11.26	12.00	
20-Feb-20	8.76	7.00	U
12-Mar-20	5.26	5.40	
16-Apr-20	5.47	5.20	
12-May-20	5.32	5.00	

** Asterisk signifies initiation or assumption of coverage.*



3-Year Price and Rating History for Mitsubishi Electric (6503.T)

6503.T	Closing Price	Target Price	
Date	(¥)	(¥)	Rating
29-Jan-20	1,566	2,310	O

** Asterisk signifies initiation or assumption of coverage.*

As of December 10, 2012 Analysts' stock rating are defined as follows:

Outperform (O) : The stock's total return is expected to outperform the relevant benchmark* over the next 12 months.

Neutral (N) : The stock's total return is expected to be in line with the relevant benchmark* over the next 12 months.

Underperform (U) : The stock's total return is expected to underperform the relevant benchmark* over the next 12 months.

**Relevant benchmark by region: As of 10th December 2012, Japanese ratings are based on a stock's total return relative to the analyst's coverage universe which consists of all companies covered by the analyst within the relevant sector, with Outperforms representing the most attractive, Neutrals the less attractive, and Underperforms the least attractive investment opportunities. As of 2nd October 2012, U.S. and Canadian as well as European (excluding Turkey) ratings are based on a stock's total return relative to the analyst's coverage universe which consists of all companies covered by the analyst within the relevant sector, with Outperforms representing the most attractive, Neutrals the less attractive, and Underperforms the least attractive investment opportunities. For Latin America, Turkey and Asia (excluding Japan and Australia), stock ratings are based on a stock's total return relative to the average total return of the relevant country or regional benchmark (India - S&P BSE Sensex Index); prior to 2nd October 2012 U.S. and Canadian ratings were based on (1) a stock's absolute total return potential to its current share price and (2) the relative attractiveness of a stock's total return potential within an analyst's coverage universe. For Australian and New Zealand stocks, the expected total return (ETR) calculation includes 12-month rolling dividend yield. An Outperform rating is assigned where an ETR is greater than or equal to 7.5%; Underperform where an ETR less than or equal to 5%. A Neutral may be assigned where the ETR is between -5% and 15%. The overlapping rating range allows analysts to assign a rating that puts ETR in the context of associated risks. Prior to 18 May 2015, ETR ranges for Outperform and Underperform ratings did not overlap with Neutral thresholds between 15% and 7.5%, which was in operation from 7 July 2011.*

Restricted (R) : In certain circumstances, Credit Suisse policy and/or applicable law and regulations preclude certain types of communications, including an investment recommendation, during the course of Credit Suisse's engagement in an investment banking transaction and in certain other circumstances.

Not Rated (NR) : Credit Suisse Equity Research does not have an investment rating or view on the stock or any other securities related to the company at this time.

Not Covered (NC) : Credit Suisse Equity Research does not provide ongoing coverage of the company or offer an investment rating or investment view on the equity security of the company or related products.

Volatility Indicator [V] : A stock is defined as volatile if the stock price has moved up or down by 20% or more in a month in at least 8 of the past 24 months or the analyst expects significant volatility going forward.

Analysts' sector weightings are distinct from analysts' stock ratings and are based on the analyst's expectations for the fundamentals and/or valuation of the sector* relative to the group's historic fundamentals and/or valuation:
Overweight : The analyst's expectation for the sector's fundamentals and/or valuation is favorable over the next 12 months.
Market Weight : The analyst's expectation for the sector's fundamentals and/or valuation is neutral over the next 12 months.
Underweight : The analyst's expectation for the sector's fundamentals and/or valuation is cautious over the next 12 months.
**An analyst's coverage sector consists of all companies covered by the analyst within the relevant sector. An analyst may cover multiple sectors.*

Credit Suisse's distribution of stock ratings (and banking clients) is:

Global Ratings Distribution

Rating	Versus universe (%)	Of which banking clients (%)
Outperform/Buy*	50%	(33% banking clients)
Neutral/Hold*	37%	(28% banking clients)
Underperform/Sell*	12%	(19% banking clients)
Restricted	2%	

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